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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Current Issue.

The perennial interest of producers in our water supply problems is well served in this issue. In addition to further notes on irrigation in Queensland, are a short review of the first annual report of the Irrigation Commission, and a very useful article on the hydraulic ram. In the second instalment of a series of notes on pig-breeding the Berkshire is fully and informatively discussed. "Roundworms in Swine" is another contribution of interest to pig-raisers. An explanation of Regulations under the Pure Seeds and Stock Foods Act will be useful to both buyers and sellers. An epitome of a paper on the welfare of women in the tropics, read at the recent Medical Congress in Melbourne, is another good feature. The sugar industry is well covered by the usual series of notes—entomological and otherwise; and much other matter of interest to agriculturists generally is also included in the contents. Topical illustrations, numerous and well reproduced, are also a strong feature of the December issue, which readers are sure to appreciate.

Ex-Diggers' Success as Sugar Growers.

"What promises to become one of the finest pieces of work accomplished in land settlement in North Queensland is found at El Arish, a soldier settlement area some 20 miles from Innisfail. Here about eighty returned men have been settled in typical scrub country to clear the land and raise crops of sugar-cane. A particularly fine type of young manhood has been assembled, and for some years past they have been engaged in the preparation of the land, the erection of homes, and the planting and harvesting of cane crops," says "The Australasian" (8th December, 1923.) El Arish has every prospect of becoming one of the most prosperous settlements in our richly-endowed North, and it is interesting to note the attention the success of ex-A.I.F. men settled there is attracting in the South. Last year the Diggers on El Arish produced 6,000 tons of sugar-cane. This year's cut was somewhere near 17,000 tons, and based on the rate at which planting has been carried out it is not improbable that the total yield from this settlement next season will approximate 25,000 tons of cane. When it is remembered that the settlement is a little more than three years old and that the work of establishment had necessarily to march with the work of production, the achievement of the El Arish settlers is a remarkably fine one.

The Agricultural Position in Queensland.

The Annual Report of the Under Secretary for Agriculture and Stock (Mr. Ernest G. E. Scriven), just published, is a comprehensive review of the agricultural position in this State. The year has been one of great departmental extension and activity, the principal factors having been the larger knowledge obtained of the needs of rural life in Queensland through the deliberations of the Council of Agriculture and its subordinate organisations, and to the expansion of the cotton industry, which would have been much greater—probably double—had the season been normal. Absence of a sufficient rainfall in the summer months made the dry period of greater severity than that of 1902, because in that year summer rains fell, but this year the summer rainfall was very meagre. The pastoral industry has had to bear a twofold weight, because, in addition to the abnormal season, very low prices have ruled for stock, and our one-time prosperous export trade in meat received a severe check through the competition from North and South America on the European market. The difficulties of the industry in this respect have been so great that a Federal Council with a State Advisory Board has been formed, with the object of opening up new markets in Asia and other countries where it is expected that a profitable trade may be found.

The Federal Statistician has calculated that the Australian export of farm and dairy produce, in which latter honey exports are included, amounted in value in 1921-2 to the sum of £11,004,649, and that production of these commodities was of the value of £195,561,000, or about equal to £35 9s. 10d. per head of population, but in considering these figures it must be remembered that the Federal statistics are for the financial year, and that those for Queensland are for the year to 31st December in each case; consequently the figures given, though a good guide, are not quite correct so far as they relate to Queensland.

The number of owners engaged in cultivation, in comparison with the population, shows a slightly better proportion for 1922 than in the preceding four years; but the proportion has not yet reached 1917, when it was one owner to 3.29 per cent. of population. Cattle-owners in proportion to population have decreased in the different classes, as also have the sheepowners excepting among those owning from 1,001 to 5,000 head, in which class there is a small gain of 2 points per cent.

The Director of Agriculture (Mr. H. C. Quodling) commenting in his report upon the indifferent year from an agricultural point of view, makes a strong comparison in favour of a cotton crop as a great revenue producer in dry seasons, and mentions the natural ability of the cotton plant, not only to live, but to produce a crop, as being in marked contrast to the maize plant, which has suffered so severely in the Southern and Central districts. The moral of the experience is, therefore, that no farmer in the districts where cotton can be grown within a payable distance of a ginnery should make his arrangements for the year without including a field of cotton. The agricultural branch has been called upon during the year to give much time and help to other departments in matters which, although indirectly having a bearing upon agriculture, were not strictly departmental business.

Though the maize crop in the Southern and Central districts has not been good, the crop in the North has been generally satisfactory, and good yields are expected from the Atherton Tableland. The work of improving the quality of the maize grown here has continued despite the season, and thirty separate experiment plots were established, covering 120 acres. Some failed, others gave but a light return, but where conditions were favourable, heavy yields were obtained; upon the Imbil experiment plot, up to 50 bushels to the acre with Funk's 90-day, and in that district yields of 68, 75, and 90 bushels to the acre were secured from the Yellow Dent plots. At another plot Star Leaming returned 80 bushels to the acre.

Mr. Quodling again emphasises his oft-repeated advice for early and systematic preparation of land for cropping, particularly in relation to wheat. The seed wheat improvement scheme instituted by the Department and carried out with the help of the State Wheat Board was continued, and in face of a late planting and irregular seasons the results were fairly good, the returns from 523 acres giving an average yield of $22\frac{52}{60}$ bushels to the acre, the highest recorded being a return of 40 bushels to the acre in the Roma district from Roma Red wheat.

The demonstration plots in the Burnett and Callide districts, formed to help the land settlement scheme of the Lands Department, whereby intending settlers can actually see what the land will produce, have taken shape and crops have been planted. The work on these plots is entirely educational, and there is no intention of establishing permanent State farms; and as soon as the objects of the Lands Department have been attained the plots will be opened for selection, with protection for the improvements effected. In addition, there were fifty-six other experimental plots in the State for crops and for fertiliser experiments; but here again the season has been responsible for a very variable success. Instructional work in fodder conservation was vigorously carried out, and, though the advice and instruction were sympathetically received, there has been but little fodder for the farmers to save.

IRRIGATION IN QUEENSLAND—VI.

H. E. A. EKLUND, late Hydraulic Engineer, Queensland Water Supply Department.

The first of this series, a historical note, was published in the July Journal. Irrigation in the Lower Burdekin was reviewed in the August number, and the instalment in the following issue covered Irrigation in the West. In the October Journal practical considerations were discussed, and the last issue contained notes on Surface Supplies. The review will be continued through succeeding issues.—Ed.

DUTY OF WATER.

The term duty is usually understood as meaning an obligation, work, or service to be rendered—something to be fulfilled or performed. In some cases the actual volume used in an irrigating season is termed "the duty," but to adhere to the meaning evidently intended by the word, the expression "duty of water" should signify the work that water *should* do in raising any particular crop. Many definitions of the expression are not happy, in that they endeavour to make the meaning too wide. The definition given by Sir Hanbury Brown, however, is both concise and clear—

> "The duty is the measure of efficient irrigation work that water can perform, expressed in terms establishing the relation between the area of crop brought to maturity and the quantity of water used in its irrigation. The expression 'efficient irrigation work' implies that the water supplied to the crop is neither more nor less than what is best for it."

Under this definition is is clearly immaterial whether soils vary in their powers to take up and retain moisture, as the "duty" will necessarily be an expression of this variation, and will, when once it is known for one crop, form a guide as to whether it will be high or low for any other crop, from the same kind of soil, in the locality under consideration. As yet there are no data available regarding the "duty" of water used in Queensland, because very few take the trouble to keep such records as are absolutely essential to make irrigation a complete success.

Where pumping is employed for obtaining the necessary water, the relationship above referred to is best expressed in terms of water required to mature 1 acre of crop. In gravity systems, where it is desired to know what area a known flow can irrigate, it is more convenient to have the term mean the area that continuous unit flow (1 cub. ft. per second, or 1 cusec) is capable of maturing.

In the former case the amount will be expressed as acre feet or acre inches, which is a definite quantity, the acre foot being an amount of water sufficient to cover 1 acre to a depth of 1 ft. The acre inch is similarly the amount of water necessary to cover 1 acre to a depth of 1 in., or, in round figures, 22,650 gallons. Table VII. is a comparative statement showing the number of gallons in from 1 to 12 acre inches.

The term "duty" as applied in gravity systems is particularly convenient, and it will be noted that 1 cusec flowing continuously for twenty-four hours is practically equal to 2 acre feet (1 acre = 43,560 sq. ft. and 1 cusec in twenty-four hours = $24 \times 60 \times 60$ cub. ft., or 86,400 cub. ft., or practically 2 acre feet).

The three principal factors which determine the duty for any particular crop are—

1. Character of soil.
2. Climate.
3. The "Personal Equation."

Character of Soil.

It is not only the physical character of the soil which has a direct bearing on the amount of water used. Equally, or perhaps rather more, important is the mechanical condition of the soil. One of the essentials, that soil be suitable for irrigation, is that this mechanical condition can be given to the soil by proper working.

But the mechanical condition desirable is not alone sufficient. Pure sand, whether wet or dry, is mechanically ideal for irrigation, but it is physically and

chemically and also practically unsuitable. Many stiff soils rich in clay may, under certain conditions, be made to yield a crop, but though such soils may have all the chemical constituents necessary for plant life, they may be physically and mechanically unsuitable for irrigation.

It is not sufficient for efficient irrigation to merely *produce* the correct mechanical condition. It is essential that throughout the growing of the crop this mechanically correct condition be maintained. This can only be done by properly working the soil, and as every application of water more or less tends to destroy this condition, cultivation is especially important and necessary after every application of water.

The character of the subsoil will also affect the duty. Where the subsoil is very porous, small (say 2-4 acre inches), and frequent, waterings will probably produce best results. If the subsoil is retentive there is a danger of waterlogging, and particular care is necessary not to use too much water. There is scarcely ever any danger of too little water being used, except where spray systems are employed. The character of the soil will also determine the irrigating head or the size of the stream that should be used. Where the soil is very porous and the subsoil also open and free, it is necessary to use a large head in order to get to the end of the furrow or plot and then shut off and go on to the next furrow, and so on. This cannot be done unless grading has been attended to, and the conclusion is naturally that though grading is necessary in all soils it is most necessary in porous soils. A little reflection will reveal also that heavy soils cannot be treated in this way, as if water were quickly run over practically no absorption would take place. The treatment for heavy soils is, therefore, in direct opposition to that for porous soils, and as the gradation of the soil varies so must the treatment vary. After a heavy soil has been covered with water very little absorption takes places, and it is therefore very necessary to see that the water does not cover over quickly. The best means to prevent this is to run a light plough or scarifier in the furrow just before applying the water, as long as the crop will permit this being done. Cultivation after irrigation is always essential, but on very light soils it may be found best not to cultivate immediately before irrigating. No definite rule can be laid down, but every irrigator is advised to make irrigation his hobby horse, the most essential thing being to record what has been done and watch the results.

Climate.

The climate has a great deal to do with the duty of water. If very hot and dry, a comparatively large volume is necessary to produce the desired result, and the duty is in such a case low. The seasons clearly have a similar effect, the duty in winter being higher than in summer.

The "Personal Equation."

The experience, knowledge, and ability of the irrigator himself have naturally a very marked effect on the duty. Where water is expensive, as in individual pumping plants, it would be of very great assistance to the irrigator to keep a careful check on the actual amount of water used. As a counter check the crop produced should also be carefully noted. Every farmer desirous of getting the best out of his land should measure all water that is used for raising the crop, whether it comes from the clouds or is obtained and applied by artificial means.

As an indication of the importance attached to the question of measuring, it might be mentioned that on all large irrigation areas neither trouble nor expense is spared to provide suitable and reliable meters. One such meter, known as the "Dethridge" and used on the Murrumbidgee Irrigation Area, is illustrated.

Measuring the Water.

Of the many and various means employed for measuring water, there is no better or more accurate method than the "weir" board. This cannot always be used, as the flow may vary and a continuous record of the volume passing the weir is, therefore, necessary. Though the weir itself is cheap, recording devices for use with weirs are expensive, and this form of measuring is therefore out of the question on large gravity schemes. But where the water required is obtained by pumping from individual plants the weir can be used to "rate" the pump. Once a pump has been properly rated the figures obtained are reliable, and as accurate as those obtained by many meters. There are very few irrigators in this State as yet making any endeavour to measure the water used, but those who do attempt it invariably have as their only guide the catalogued capacity of a pump.

FIG. 31.—THE "DETHRIDGE" METER.

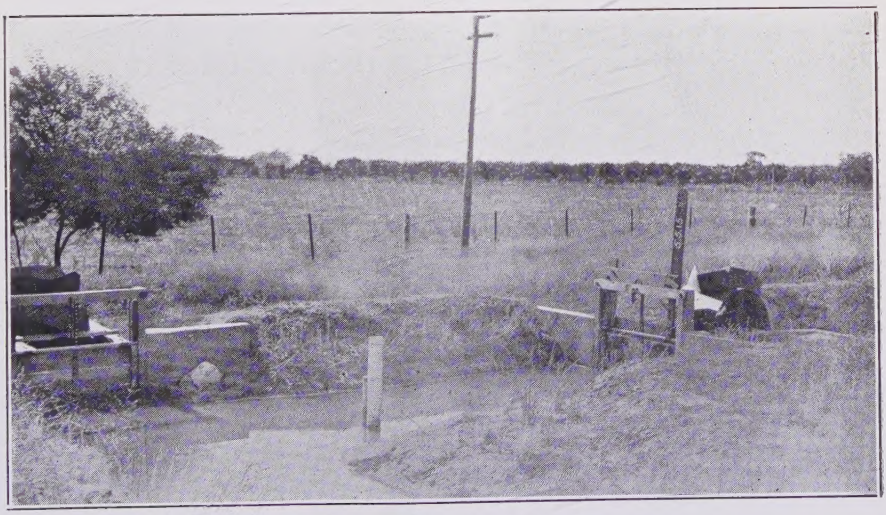
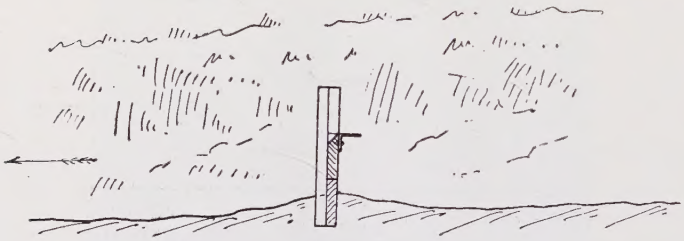


FIG. 32.—OFFTAKE FROM THE LATERAL. (NOTE METERS.)

Weirboard:

Made from 3, 9"×2" Pine Planks.
9' long, fixed with 3"×2" battens.
Edges of Opening splayed on the downstream side.



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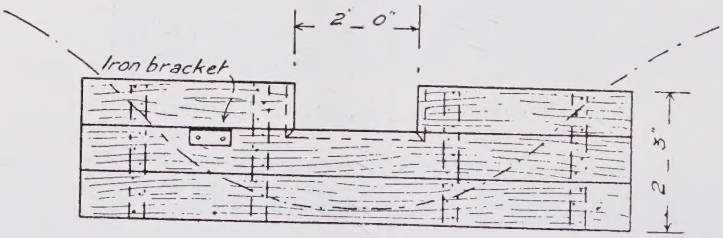
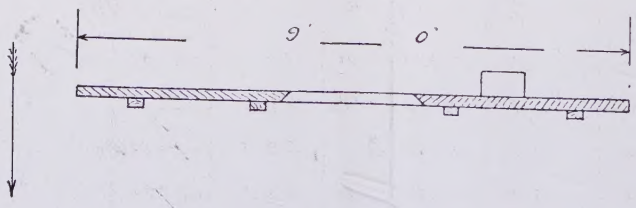


Elevation.



Plan.

Fig 33

Table IX.

Shewing discharge over a Right angle V notch Weir board.

Measure width from L to L, then half this length equals the depth in centre of notch

Depth of Water in centre of notch	Gallons per Minute	Gallons per 24 hours	Depth of Water in centre of notch	Gallons per Minute	Gallons per 24 hours
1 .	1·9	2735	2 1/8	12·5	18,052
1/16	2·2	3190	3/16	13·5	19,420
1/8	2·6	3690	1/4	14·4	20,789
3/16	2·9	4239	5/16	15 5	22,307
1/4	3·3	4787	3/8	16 5	23825
5/16	3·7	5420	7/16	17 6	25452
3/8	4·2	6018	1/2	18·8	27,080
7/16	4·7	6770	9/16	20 0	28,837
1/2	5·2	7522	5/8	21·2	30,395
9/16	5 8	8342	11/16	22 6	32,530
5/8	6·4	9163	3/4	23 9	34,365
11/16	7·0	10120	13/16	25·3	36,448
3/4	7·7	11078	7/8	26 7	38431
13/16	8·4	12104	15/16	28 2	40,551
7/8	9·1	13130	3	29 6	42,672
15/16	9·9	14292	1/2	43·6	62,776
2 .	10·7	15454	4	60 9	87,702

FIG. 34.

It has already been explained how the capacity of a pump will vary with a variation in speed and head, and to the man who wants to know what he is doing some check on the pump is necessary. In any case, before the capacity of a pump can be at all depended upon, it is necessary that it should be "rated" under the actual conditions of working.

The process of rating a pump, at least sufficiently close for all practical purposes, is a simple matter and one which any intelligent man can perform. The appliances are equally simple and have the distinct advantage that they are extremely inexpensive, merely comprising some boards, a few nails, a saw, and a 2-ft. rule.

Careful and extensive experiments carried out by various hydraulic engineers at different times have established a system of measuring water flowing over a notch made in a board. By carefully measuring the depth of overflow the volume can be calculated for practically any regular shape of notch, but for simplicity and uniformity three distinct shapes are usually adhered to. These are the rectangular, the trapezoidal, and the right-angled V notch. The forms recommended for use by irrigators are the rectangular and the V-notched weir-boards. Table VIII. gives discharges corresponding to depth of overflow for a notch 2 ft. wide, and Table IX. gives the volume flowing over a right-angled V notch, this latter being useful for small flows. Fig. 33 gives dimensions and particulars for constructing these weir-boards, and Fig. 34 shows how they are erected. It is necessary that the overfall be clear, and to get this effect the lip of the weirboard should be not less than 8 in. above the bottom of the drain, and a point on the drain should be selected where the water, after going over the weir, has a free "get-away." Care must be taken to set the weirboard level and plumb.

The orthodox method of measuring the water passing over the weir consists in correctly getting the depth of water over the lip of the weir. To do this, admit water to the weir until it is just level with bottom of notch, but not running over. Then drive a stake about 6 ft. up-stream and at the side, so that the top is just level with the water. It follows then that the top of the stake and the lip of the weir are just level. Then admit full flow to the weir and put the rule on the stake and refer to Table VIII. for gallons per minute, corresponding to the depth of water on the stake. The water just above the weir should be as still as possible, and for this reason a place in the drain should be selected where the grade changes from fairly flat to sufficiently steep to let the water away after passing the weir.

If the weirboard is made a good length, say long enough to have a clear 18 in. in water at either end of the notch, a ledge may be made at the side of the weir on the upstream side and level with the bottom of the notch. The rule can be placed on this and a reading thus taken. Though not so accurate as the above method, it is fairly close and will generally be found quite good enough for practical purposes.

In rating a pump, however, the former method should be used, and at the same time particular attention must be given to the speed. The suction head should be measured, as this is usually the head most subjected to variation, unless a system is used where the discharge head is intended to vary. In the latter case no pump which is not designed for a variable head should be permissible, and in such a case the only observation necessary as regards the pump is to make sure that it runs at the prescribed speed. If the pump is not designed for a variable head and such variation in head as does occur is due to unforeseen causes, the speed rules given will be found useful for getting the pump to deliver its maximum capacity. Table X. gives various sizes of pumps with capacity, horse-power required, and the speeds between which their best capacity should lie; also indicating the efficiency that should be obtained.

LAYING OUT THE LAND AND HEAD DITCHES.

"You may dream and scheme and connive and contrive, but you will never find an effective substitute for hard, honest work."

Laying Out the Land.

Irrigation subsequent to settlement is uphill work for the designer. He feels that the land surveyor's object in life is merely to get a pretty-looking plan. The fact that a farmer or settler is expected to make a living on the area after it has been surveyed seems but a secondary, or third, or fourth consideration. The common-sense way is, of course, to lay it out on topographical lines.

To make the best of a bad job the first thing to do is to properly contour the area to be irrigated. Whether the system is gravity or pumping, or whether the irrigation is by flooding or furrow, head ditches are necessary. To correctly locate

these requires skill and care. From these head ditches distribution of the water should be across the contours, provided the grade is not too steep. The fall given or allowed to the ditches will depend on the class of soil.

Head Ditches.

The farmer who can put in head ditches made of concrete will save expense in the long run. Not only will he be free from an accumulation of weeds that have to be cleaned out every time the ditches are wanted, but he will also prevent seepage if the water is obtained by pumping. Saving of water means saving in power and better economy all round. Thrifty John Chinaman carries the water to just that plant that needs it. By doing so he not only saves water, which, wasted in seepage and evaporation, gives no return, but saves labour in not having to subsequently clean out superfluous growth. Concrete is certainly expensive, but the thrifty farmer will do a little every year until he has completed his system. Having a head ditch made of concrete, a good head of water, and his land properly graded, one man can water over 5 acres a day where the furrow system is in use.

The distinct advantage of concrete channels lies in the fact that the grade is only a secondary consideration. Where the grade obtainable is too low for an earthen channel, concrete is better because of the greater velocity due to less friction. In cases where the grade of an earthen channel would be too great because of probable erosion, the concrete channel does not suffer from this drawback. In all cases the sectional area of a concrete channel is less than that of the earthen ditch conveying the same amount of water.

Where concrete channels are built, these should be so constructed that the bottom of the opening in the side is level with the surface drain taking the water to furrow or plot.

The most convenient kind for the farmer to build is the rectangular section, and though the semicircular has advantages, these are hardly sufficient to offset the greater difficulty of constructing it.

Ready-made semicircular concrete ditches in sections are on the market at a reasonable price, but unless made close to or on the irrigation area, the cost of transit makes this type too expensive for general use.

Ordinary earth ditches have successfully been sprayed with cement by means of the "cement gun," and so made to act as a concrete ditch. Recent Californian practice seems to favour this kind of ditch, and it is claimed that it is nearly as durable and quite as efficient as the ordinary concrete ditch.

Where funds do not run to concrete ditches, it is well to remember that the ground on either side of the earth-ditch is a breeding-ground for weeds. These should be cleaned away before irrigating, or the seeds, falling into the water, will be distributed over the cultivated area.

After having decided upon the location of the head ditches, the next thing to determine is the size of the ditches. The size is governed by two factors—the quantity of water to be carried and the grade of the ditch. The more water a ditch has to carry the larger it must be. The greater the grade the smaller the ditch required to carry the same quantity of water; but the grade must not be too great or erosion will take place. The eroded earth will be carried along by the water to some place where the velocity is less and there deposited. This may occur to such an extent that the ditch fills up and causes the water to break out in some places, whilst making the ditch too deep somewhere else. Hence it is necessary to avoid sudden changes in grade. The more even the grade the less the trouble in maintaining the ditch.

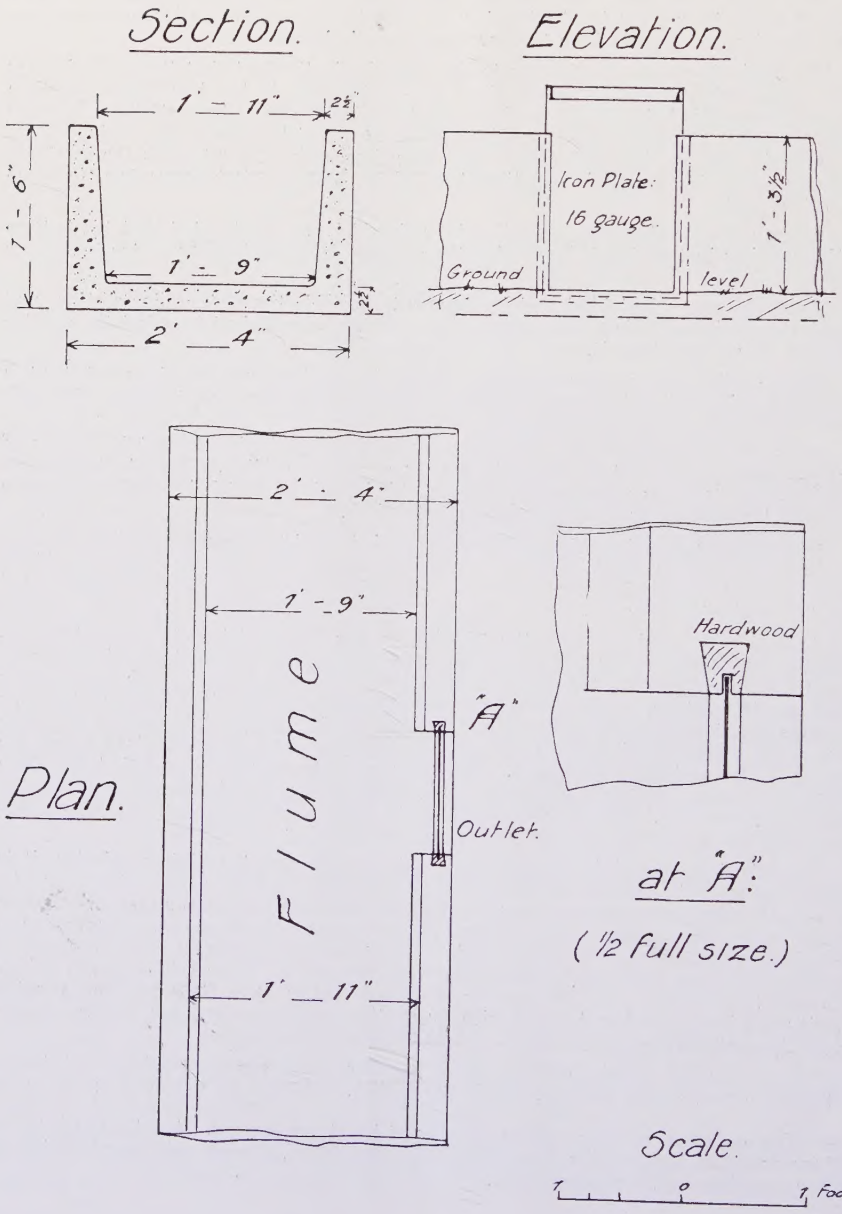
Though it is essential to avoid too great a grade and too high a velocity, it is equally necessary to have the grade so that the velocity is not too small. The evils of a low velocity are—too much seepage, too rapid a growth of weeds, and a disproportionate loss by evaporation. The mean velocity to be aimed at in small earthen channels is in the neighbourhood of 1.5 ft. per second.* Circumstances naturally limit this, and it sometimes becomes necessary to choose between two evils. When this necessity arises, it is well to remember that the greater velocity is better than the less. Too great a velocity can be handled and coped with by putting in checks or drops, but to remedy a velocity that has proved too low is an expensive undertaking.

Table X., showing the grade or fall of the ditch, with resultant velocity of stream and quantity of water flowing, should be useful. It will be found that the same

*Merriman recommends a mean velocity of 1.8 ft. per second. A velocity of 2.3 ft. will be found to keep weeds from becoming established, though this only applied to canals carrying supplies perennially.

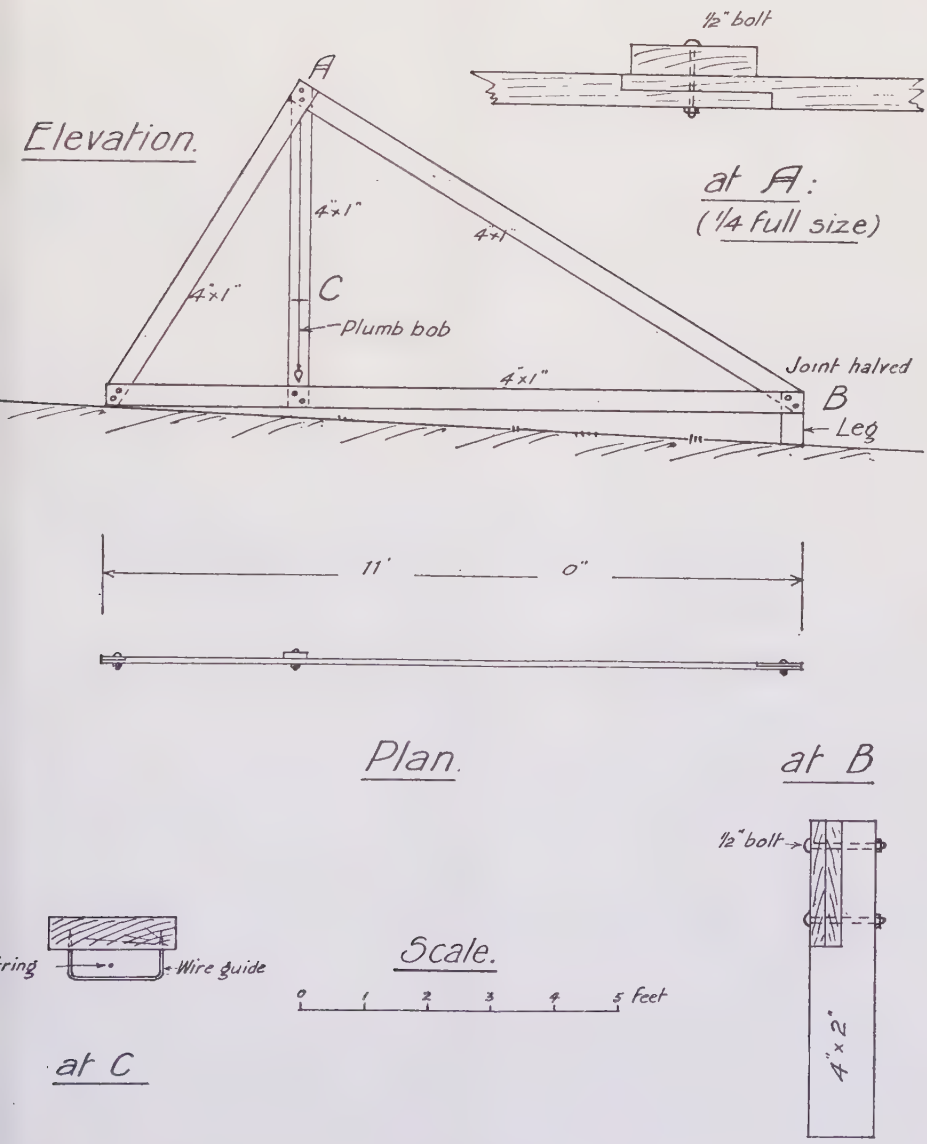
CONCRETE FLUME & Outlet

Fig. 35



SKETCH OF Grading Triangle.

Fig 36



quantity of water is carried by ditches which differ in size when the grade is different. The velocity of water in any ditch will also depend on the smoothness of the surface of bottom and banks. If rough and lumpy or overgrown with grass, the velocity and therefore the quantity flowing will be considerably reduced. The tables have been calculated for clean drains reasonably free from lumps and irregularities.

When the amount of water likely to be wanted has been ascertained and the grades available for head ditches are known, the farmer can, by use of these tables, determine the size of ditch most suitable for his needs.

To prevent erosion of ditches the grade chosen must be such as to keep the velocity of the water within safe limits for the class of soil through which the ditch passes.

Safe limits of velocity through various classes of soil determined by experiments, and which may be used as a guide, are given by many authorities, and the approximate mean results appear to be:—

In light sandy soil rich in humus the velocity should be about ..	¼ ft. per second, or 0.17 m. per hour.
In light clay soil the velocity should be about	½ ft. per second, or 0.34 m. per hour.
In coarser open sandy soil the velocity should be about	⅔ ft. per second, or 0.45 m. per hour.
In gravelly soil the velocity should be about	1 ft. per second, or 0.68 m. per hour.
In coarse gravelly soils	2 ft. per second, or 1.36 m. per hour.

It is not advisable to adopt a velocity much greater than this anywhere, as a stream having a velocity of between 2 and 3 miles per hour is capable of moving stones the size of an egg, while a stream with a velocity of over 3 miles per hour will erode soft schist.

For safe mean velocity of water in ditches in feet per second, "Kent" gives:—

Material of channel.	Feet per second.
Soft brown earth	0.3
Soft loam	0.6
Pure sand	1.1
Gravel	2.6
Sandy soil, 15 per cent. clay	1.2
Sandy soil, 40 per cent. clay	1.8
Loamy soil, 65 per cent. clay	3.0
Clay loam, 80 per cent. to 85 per cent. clay	4.8
Agricultural clay, 95 per cent. clay	6.2
Clay	7.2

The orthodox method for laying out the line for ditch or drain is by means of dumpy level and staff. It is not every farmer who can use the level, nor would his requirements in that direction warrant the outlay necessary to obtain an instrument. There are many simple contrivances which, in the hands of an intelligent and careful man, can be made to give good results sufficiently accurate for ordinary purposes. One such, also useful when checking the evenness of depth of an already surveyed and constructed drain, is the "triangle." It appears to be much favoured by the American irrigationists and is fully described in the "United States Agricultural Bulletin," No. 158, by Johnstone and Stannard. (*See* Fig. 36.)

The length of the base line is 11 feet. It will be noted that 66, which is the number of feet in a chain, and 5,280, the number of feet in a mile, are both even multiples of 11. The table showing grades per chain and mile will be found convenient for use with the triangle.

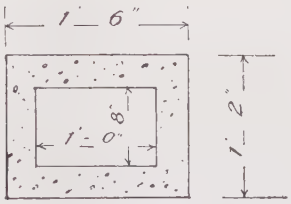
Assuming that it is desired to run or check a line having a grade of 6 inches per chain, proceed thus:—Divide 66 by 11 = 6. This is the number of times that the triangle must be applied end to end to cover the distance 66 feet or one chain. Divide the grade by the number of applications for the distance, whether chain or mile; in this case: 6 inches ÷ 6 = 1 inch, which is the length of the leg projecting below the base at one end of the triangle. If the calculation is made according to the grade per mile divide 5,280 by 11 = 480. If the grade is to be 10 feet per mile

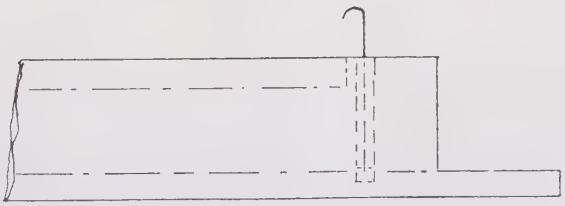
·CONCRETE·SLUICE·BOX·

(Can also be made of Concrete Slabs, in which case joints should be dowelled and grouted.)

Fig. 37

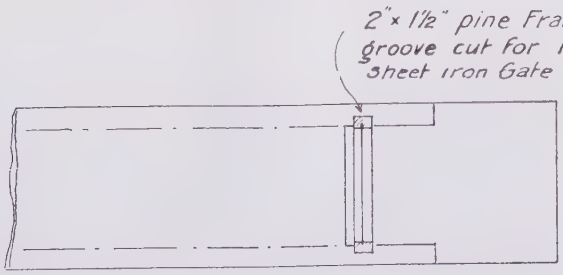
Section.



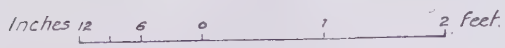


Elevation.

Plan.



Scale.



divide 10 × 12 by 480 = ¼ in., the length of the leg in this case. The triangle will be found particularly useful in checking the evenness of grade, as any two points 11 feet apart must show the same difference in level if the grade is uniform. (*See* Table XII.)

The head ditch made for the purposes of irrigation necessarily differs considerably in cross section from the distributing drain for a stock watering supply. In the latter case the object aimed at is to keep the flowing water level *below* the natural surface. Head ditches for irrigation are made to keep the flowing water level well *above* the natural surface to permit the ditch being tapped where required. The earth taken out of the ditch will, therefore, in most cases be found insufficient to make the banks of the required height and thickness. The deficiency should be made up by earth taken from as large an area as possible to prevent hollows.

The outlets from the ditches to the irrigated plots are called "sluice boxes." These may be made of wood or concrete, but concrete is preferable on account of its greater durability. If white ants can be kept in check by poisoning, wood may be used for a season or two on account of cheapness and ease in construction, but these wood boxes should be replaced by concrete as soon as possible. The essential thing about the sluice box is that the opening can be regulated. Two designs of sluice boxes are shown in Figs. 37 and 38, the former being made of concrete, the latter of wood. The boxes may be made wherever most convenient, but it is essential that they be well rammed when put into the bank, so that no water leaks past them. The length of the box depends on the thickness of the bank, and other dimensions may be varied to suit each case. Table XIII. shows volume of water passing through with various openings of the gate for the sizes given.

Grading the Land.

When the position of head ditches has been decided upon, the preparation of the land can commence with the definite object in view that the fall is to be kept as even as possible. In ploughing, harrowing, cross-ploughing, &c., a good deal can be accomplished by good judgment, so rendering the final operation of grading less laborious. As a matter of fact, all operations from first ploughing to final grading are pure judgment based on the result of the contour survey. Some men will learn to grade quickly and effectively with almost any implement; others may never become expert, though perseverance is a good quality to possess even here, and seeing an expert doing the work a few times is better than trying to find out.

"The gospel of the plough" is not necessarily deep ploughing. The latter *can* be overdone; though considering the depth of our Queensland soils it is not likely to be carried to excess. But it is always advisable to subsoil, and judicious subsoiling is a very necessary adjunct to irrigation. By "subsoiling" is meant the stirring and opening up of the subsoil. It is distinctly *not* advisable to bring the subsoil to the top, especially if it contains a large percentage of clay.

When the soil has been ploughed to a depth of, say, 9 to 10 inches and reduced to a fairly fine tilth, grading can commence in earnest. Most of the implements used for grading are American in origin, or adaptions to suit Australian conditions.

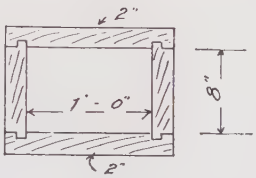
If the ground is rather uneven and "knobby" the first implement to be used is the "buck-scraper." This is purely an earth-scoop, so made that filling and emptying are easily effected without stopping the pulling team.

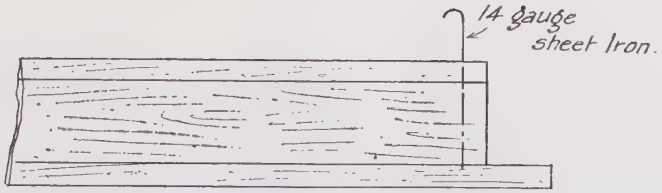
The implement can be obtained from Australian makers in two- or four-horse sizes, the larger size being worked by two men. In Fig. 39 this is shown in the act of filling, and Fig. 40 shows the position when just on the point of discharging its load. Unlike the ordinary earth-scoop, the load, when in the act of being dropped, can be distributed over a considerable distance. The buck scraper may be likened to a jack plane taking off the rough. The buck scrapers used at Yanco, on the Murrumbidgee Irrigation Areas, are made by the Golden City Implement Company, of Bendigo. The implement is thus described by Mr. Quodling, the officer in charge of this work on the Area: "It is of particular utility on uneven land—*i.e.*, land having small hills and hollows, the preliminary treatment of which necessitates scraping off hillocks for material to fill the hollows near by, and thereby roughly covering up the surface. It does not lend itself to the imparting of a neat finish to grading, being invariably followed by the Byrne smoother, or one or other of the louvre graders as a finisher. The implement is often used for moving earth through a distance of several chains, which in being dumped is roughly spread and smoothed by causing the implement to be drawn over the dumped material when held almost vertically on its cutting edge, the angle at which it stands being controlled by the operator by means of a short length of rope attached to the top of the handle or lever."

Necessarily land must be ploughed, unless it is almost a pure sand, and worked down to a fairly fine surface before the buck scraper or any other grading implement can be used to advantage.

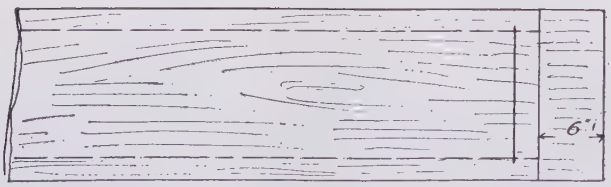
SKETCH
— of —
WOODEN SLUICE

SECTION





ELEVATION



PLAN

Fig. 38

FIG. 39.—BUCK SCRAPER (FILLING).

FIG. 40.—BUCK SCRAPER (DISCHARGING).

Fig. 41.—The Horne Grader.

Fig. 42.—The Pavey Grader.

There are several kinds of smoothers in use for following up the buck scraper. These are nearly all more or less automatic in action and one of the favourities appears to be the Horne Grader, shown in Fig. 41. On account of the length of this implement the automatic action is very distinct. The louvres or cross pieces are movable, and any earth carried can be discharged where desired; but it is clear that whether the discharge device is operated or not it will "pick up" on prominences and drop the load in hollows.

The Pavey Grader, shown in Fig. 42, is made by Pavey, Merrigum, Victoria, and is thus described by Mr. Quodling:—

"This implement has an inner frame working inside another which is capable of being raised or lowered by a lever so as to regulate the "bite," and so as to dump material into depressions, which is then smoothed off by the rear louvre. It is a very—perhaps the most—useful grading implement, and in the hands of a skilled man can turn out well-finished work. Having only two louvres as compared with three, four, or five (depending on the size of the implement) which the Byrne grader is provided with, it does not span the length the latter does, and therefore more closely follows undulations of the surface and does not reduce the land to as true a plane surface.

Byrne Grader (Fig. 43) made by Golden City Implement Company, Bendigo, and the *Horne Grader* (Fig. 41) made by Horne, Tatura, Victoria, are used in a similar fashion to the Pavey Grader, but both possess an advantage over the Pavey when it comes to imparting a good finish to the work.

The Horne Grader is, roughly speaking, similar to the Byrne, but having a longer level operated by a man standing, whose view is less restricted than when operating from a sitting position, as is the case with the short lever of the Byrne Grader. The Horne is perhaps a little better than the latter.

The Delver (made by the Golden City Implement Company), is a V-shaped implement for forming ditches by crowding earth from a narrow strip of ploughed ground equally on each side of the axis of the strips so as to form banks. It is an efficient implement for constructing ditches, having a finished width between tops of batters up to 9 or 10 feet and a depth below natural surface up to 15 inches. Where ditches are carried across depressions and the embankment is formed in advance to the proper grades, it can be used to full advantage.

The Byrne Smoother (Golden City Implement Company), shown in Fig. 44, besides being used as its name implies, is largely used also for putting up low levees or check banks for the purpose of irrigating by flooding, in definite courses. When so used it is operated by one man driving a four-horse team across the direction of irrigation, a thin layer of the surface soil being scraped off and gathered for dumping on the line of the levee. The dumping is effected by the transference of the driver's weight backwards on the platform on which he stands, which causes the implement to tilt and release the gathered material. The driver then steps a little forward and causes the rear end to rise and clear the bank, and at the same time to shape it. The team must be kept moving and the number of sections of levees that may be formed by one stroke of the implement is limited only by the size of the field. On reversing the team the banks are extended again by the width of the implement, and so on, until completed. As only low banks are usually required in this connection, sufficient material is gathered by one stroke of the machine; but the banks may be strengthened by reversing the team and returning along the same track. Irregularities of the surface are smoothed out in the process thus described, but it is necessary to finish the grading by drawing the implement parallel with the banks or, better still (since it, like the Pavey Grader, has only a short base and thus closely follows the undulations) to finish with one or other of the louvre graders.

Another use this implement may be put to is that of crowding earth from the high to the low side of the narrow bank bounded by the check banks, one draft chain being shortened to enable the implement to be set at the required angle on the same principle as an ordinary road grader.

The implements described above are all good, but users naturally have their own fancies and for some reason prefer one type to others. Each tool, however, requires a certain amount of practice before the user can become expert, and no one should be discouraged or blame the implement if not immediately successful.

After grading has been accomplished to the farmer's satisfaction, the land is again thoroughly and deeply ploughed and harrowed and well subsoiled, and it is best to then again run over it with a home-made "smoother" if the land is to be sown with seeds. If the furrow system is intended and larger plants, such as maize, sugar-cane, or vines are to be grown, the smoothing may be dispensed with, though the ploughing and harrowing are necessary.

[*In the next issue Systems of Irrigation will be discussed.*]

Fig. 43.—The Byrne Grader.

Fig. 44.—The Byrne Smoother.

THE HYDRAULIC RAM.*

By DR. W. S. H. CLEGHORNE, A.M.I. Mech. E., Lecturer in Engineering, School of Agriculture, Potchefstroom.

Given suitable conditions, the hydraulic ram is an excellent machine for raising water, and it is probably only because it is so little known to farmers that it is not in more general use for farm water-supply.

Conditions Necessary for Successful Operation.

The hydraulic ram utilises the momentum of a stream of water, falling through a small height, to raise a *portion* of that water to a greater height. Thus, the two essentials to the successful operation of the ram are (1) a running stream of water with (2) a sufficient fall.

The stream need not be large; if there is a good working fall a flow of as little as 1½ gallon per minute is sufficient to operate a ram for small supplies. In fact, if an arrangement such as that shown in Fig. 2 is employed, a still smaller stream will operate a small ram at intervals, with periods of rest between. Fig. 2 is described later on.

A working fall as low as 18 inches will do to work a ram, but a minimum fall of 3 feet is preferable. The greater the working fall that can be obtained (up to about one-fifth the height the water is to be raised above the ram), the less the ram will cost and the less driving water will it require to lift a given quantity through a given height.

The installation of the ram will be cheapened if just above where the ram is to be installed the bed of the stream is fairly steep—*i.e.*, if the necessary fall occurs in only a short distance along the course of the stream.

The distance to which the ram delivers (*i.e.*, the length of the delivery pipe) may be very great; rams are in operation delivering over distances up to 2 or 3 miles.

Principles of Action.

Referring to Fig. 1, the essential parts of a hydraulic ram are:—

(1) A straight drive-pipe leading the water from the feed or supply tank (which is replenished from the stream above the fall) to the ram.

(2) An escape or impetus valve.

(3) An air-vessel.

(4) A discharge or delivery pipe, of smaller diameter than the drive-pipe, leading to the elevated storage tank.

(5) A check or non-return valve at the entrance to the air-vessel.

While the valve V is closed, the impetus valve remains open, due to its own weight (or sometimes to the action of a spring). When the valve V is opened the drive-pipe fills, and water begins to escape past the impetus valve; the water in the drive-pipe meanwhile gains velocity and momentum. This goes on till the velocity of the escaping water becomes sufficient to close the impetus valve. The water being no longer able to escape through the impetus valve, is then carried by its momentum past the check valve into the air-vessel, and finally up the delivery pipe into the storage tank.

This continues till the momentum is destroyed, when there is a slight recoil of the water, the check valve closes, the impetus valve again opens automatically, and the cycle of operations is repeated.

During the recoil of the water, a little air is drawn in through the pinhole P or through a small valve opening inwards only and called a snifting valve, and replenishes the air-vessel, thus preventing it from becoming water-logged.

Capacity and Efficiency of Rams.

If a ram were perfect in all respects—*i.e.*, if its efficiency were 100 per cent.—the full amount of work done by the falling water would be returned in lifting a portion of that water to a higher elevation. The fall being taken as the vertical distance between the water-level in the feed-tank and the impetus valve (*h* in Fig. 1)

* Jour. Dept. Ag. S. Africa, vol. vii., No. 4, Oct., 1923.

and the lift as the vertical distance between the impetus valve and the upper end of the delivery pipe (h, in Fig. 1) then, theoretically:—

TABLE I.

$\frac{1}{3}$	of the water supplied to the drive-pipe will be raised through a lift				3	times as great as the fall.
$\frac{1}{5}$	,,	,,	,,	,,	5	,,	,,
$\frac{1}{8}$	,,	,,	,,	,,	8	,,	,,
$\frac{1}{10}$	,,	,,	,,	,,	10	,,	,,
$\frac{1}{15}$	,,	,,	,,	,,	15	,,	,,
$\frac{1}{20}$	,,	,,	,,	,,	20	,,	,,

Since, however, no ram is perfectly efficient, the theoretical figures in the first column are reduced in practice.

The efficiency of a hydraulic ram may be defined as the fraction or percentage of the natural effect that is usefully employed in forcing water up the delivery pipe. The greater the fall is in proportion to the lift, the higher is the efficiency, but in practice it is seldom advisable to have the fall greater than one-fifth of the lift. With a high fall the strains set up are excessive, and the ram wears out quickly.

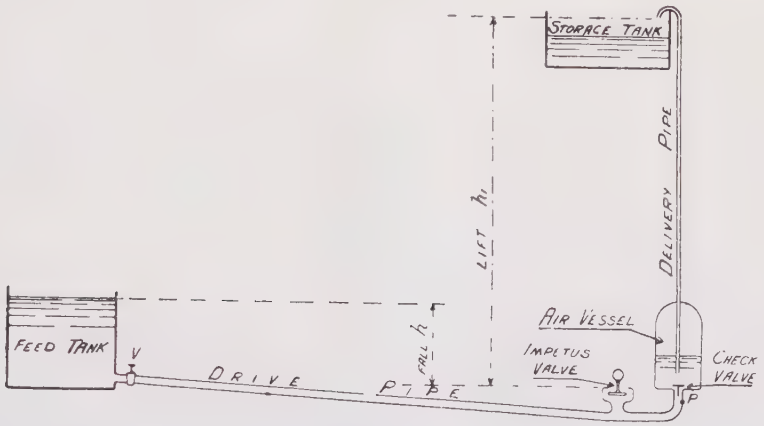


FIG. 1

As the result of over 1,100 experiments, Eytelwein gives the formula:

$$\text{Efficiency} = 1{\cdot}12 - 0{\cdot}2\sqrt{\frac{h_1}{h}}.$$

from which the following table has been calculated:—

TABLE II.

	Lift h_1, 3 times the fall h.	Lift 5 times the fall.	Lift 8 times the fall.	Lift 10 times the fall.	Lift 15 times the fall.	Lift 20 times the fall.
Value of efficiency ..	0·774	0·673	0·555	0·488	0·345	0·226

The theoretical quantities in the first column of Table I. may now be changed into actual quantities by multiplying each of them by the corresponding efficiency in Table II., giving:—

TABLE III.

0·258	of the water supplied to the drive-pipe will be raised through a lift				3	times as great as the fall.
0·134	,,	,,	,,	,,	5	,,	,,
0·069	,,	,,	,,	,,	8	,,	,,
0·0488	,,	,,	,,	,,	10	,,	,,
0·023	,,	,,	,,	,,	15	,,	,,
0·0113	,,	,,	,,	,,	20	,,	,,

The figures given in Tables I. and III. have been plotted in Fig. 3, giving the curves marked "theoretical" and "actual" respectively. The latter curve is useful for predicting the performance of a suitable ram under given conditions. For

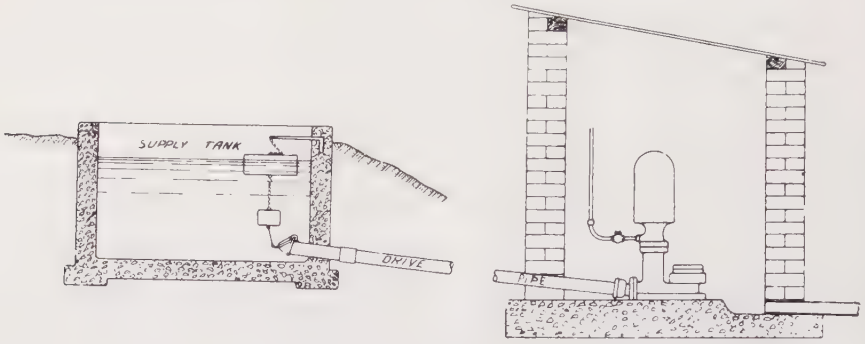


FIG. 2.

example, suppose we wish to find what fraction of the total water supplied to the drive-pipe will be raised through a vertical height h_1 (Fig. 1) six times as great as the fall h (Fig. 1), from point "6" in the base line erect a perpendicular to cut the "actual" curve in the point A. Through A, draw the horizontal AB. This gives OB, which, on measurement, is found to be equal to 0·105 or fully one-tenth. A similar method can be employed for any proportion of lift to fall.

Proportions, &c., of a Hydraulic Ram.

The following information is useful:—

The drive-pipe should be straight, *i.e.* free from bends, and not less in length than five times the vertical height (h. Fig. 1) of the fall of water.

In the case of small rams, the length of the drive-pipe should be about equal to the vertical height (h_1, Fig. 1) to which the water has to be raised. If it is shorter, water is liable to be forced back into the source of supply while the check valve is closing.

The above rules together imply that, for satisfactory working, the fall should not be greater than one-fifth of the lift.

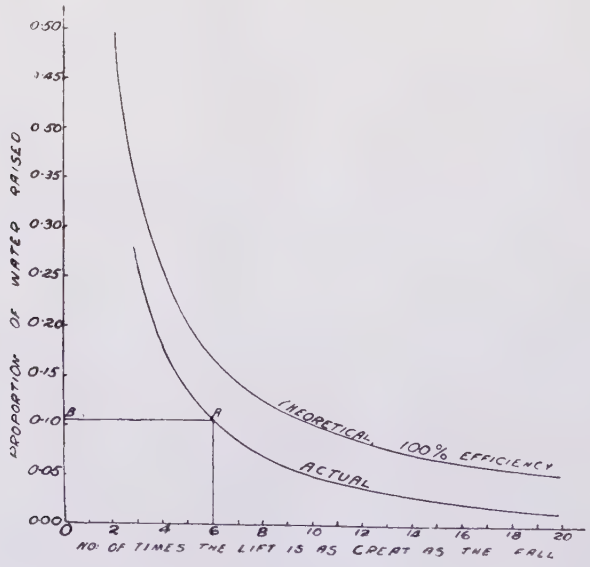


FIG. 3

The air-vessel plays two important parts, viz.:—

(1) The contained air acts as a cushion and minimises the stresses set up by water-hammer action.

(2) The air acts as a store of energy, being compressed by water entering the air-vessel during the working stroke and expanding again during the idle stroke (*i.e.*, while the impetus valve is open), so expelling the water that entered during the working stroke and maintaining a fairly constant flow through the delivery pipe.

Since, when the check-valve is closed, the pressure on the air in the air-vessel will be greater, the greater the vertical height of the delivery pipe, it is evident that the capacity of the air-vessel should be proportioned to suit. A good rule is: The cubic-content of the air-vessel should be approximately equal to twice that of a portion of the delivery pipe, the length of which is equal to the vertical height (h_1) through which the water has to be raised.

If possible, turns should be avoided in the delivery pipe. When this is not possible, changes of direction should be effected by easy bends of large radius, so that there will be as little obstruction to the flow of the water as may be.

With a long drive-pipe there are fewer beats per minute than with a short one. In the case of a certain ram, with a drive-pipe 60 feet long, the beats numbered from 28 to 35 per minute, while with a drive-pipe approximately 8 feet long they varied from 100 to 150 per minute. The efficiency was nearly the same in the two cases, but it was more constant with the longer drive-pipe.

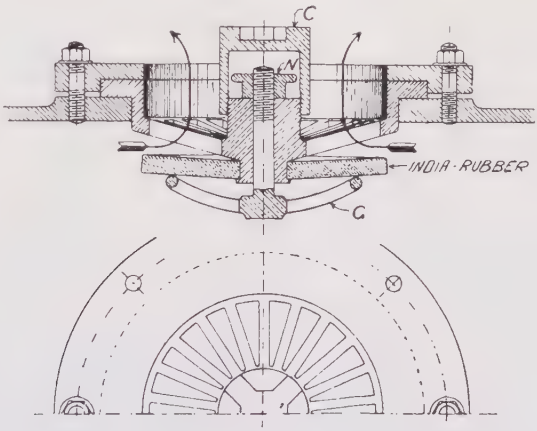


FIG. 4.

The following table is given by the Goulds Manufacturing Company:—

Table of proportionate head of fall giving highest efficiency in operation of hydraulic rams.

To deliver water to a height of	Place ram under	Conducted through
20 feet above ram	3 ft. head of fall	30 ft. of drive-pipe
30 ,, ,,	4 ,, ,,	30 ,, ,,
40 ,, ,,	5 ,, ,,	40 ,, ,,
50 ,, ,,	7 ,, ,,	50 ,, ,,
60 ,, ,,	8 ,, ,,	60 ,, ,,
80 ,, ,,	10 ,, ,,	80 ,, ,,
100 ,, ,,	14 ,, ,,	100 ,, ,,
120 ,, ,,	17 ,, ,,	125 ,, ,,

Messrs. Goulds also state that, for their rams—

"As a general rule, there should be 1 foot of fall for each 7 feet of lift, and the ram should never be installed under less than 3 feet of fall, as this is the smallest fall under which it will operate. The fall between the source of supply and the ram should not be greater than specified in the table above, as a greater fall causes an unnecessary strain on the ram and piping and will interfere with the operation of the ram."

Installation.

In the case of a stream, to supply the ram with water it may be necessary to construct a weir across the stream in order to form a pond. From the lower part of that pond comes the supply pipe. A strainer should always be placed on the inlet end of the supply pipe to prevent it and the ram from becoming choked with débris.

Sometimes the slope of the land is too gentle to allow of the required fall being obtained within the length the drive-pipe should be, according to the above rules. When this is so, the water may be piped from the source to an intermediate point at the required distance from the ram. At this point an open barrel can be located and the drive-pipe taken from it. The barrel can be connected to the source of supply by ordinary stoneware pipes at least a size larger than the drive-pipe, which leads from barrel to ram.

It is customary to place the ram in a small house. In cold countries, this prevents damage by freezing, but even when there is little fear of freezing, it is good practice to house the ram as a protection against the weather and damage from other causes. The ram should be high enough above the floor of the house to prevent the snifting valve from being submerged by the waste-water. This height need not be great,

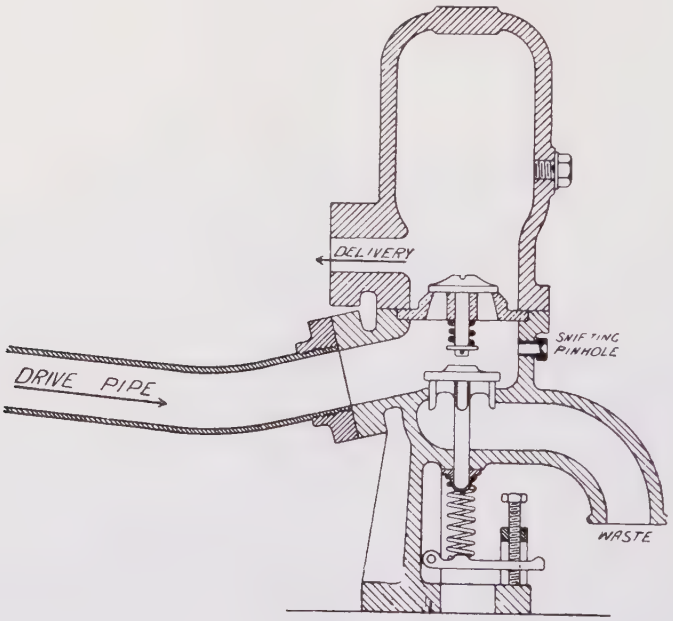


FIG. 5.

provided the drain from the ram-house is large enough and properly made. The ram should be bolted securely to a rigid timber or masonry foundation, which forms a solid support and relieves the connecting pipes from undue strain.

The inlet end of the drive-pipe should be placed so that it will always be completely submerged, otherwise the air may be drawn into the ram and will stop its action. This does not diminish the driving head, which is measured from the *surface* of the water in the supply pond or tank. Further, to prevent the ram from being stopped by air, all joints in the drive pipe should be airtight.

Examples of Rams and Ram Installations.

Figure 2 shows a Blake's "Hydram" installed for a small water supply. This ram is fitted with valves of the india-rubber disc type, which are silent in operation and diminish jarring and wear. Fig. 4 shows a vertical section through the impetus valve. The escape of the water is indicated by the arrows. The valve can be throttled or regulated by raising the wheel shaped guard G. This is done by removing the guard cap C and turning the nut N. Water enters the supply tank from some natural source. The drive-pipe is fitted with a flap valve, attached to a float, for starting and stopping the ram automatically. The lower float is just able

to keep the flap valve open after it has been raised by the upper float. When the water-level falls below the lower float, the flap closes and remains closed till the water-level rises sufficiently to cause the upper float to again open the flap valve and restart the ram. As already stated, this arrangement of floats is only necessary for a very small water supply.

Fig. 5 illustrates the "Decoeur" ram. The valves are light in weight, and the impetus-valve spring can be adjusted to regulate the number of beats per minute to suit varying conditions. The escape, or waste, outlet should be kept submerged in order to give a suction effect which causes the water to give up some of its contained air, and so replenish the air-vessel automatically and reduce the violence of the action, and therefore also the noise and wear and tear. When this is done a snifting pin-hole or valve becomes unnecessary.

Occasionally circumstances permit of the arrangement shown in Fig. 6, which embodies some novel features.

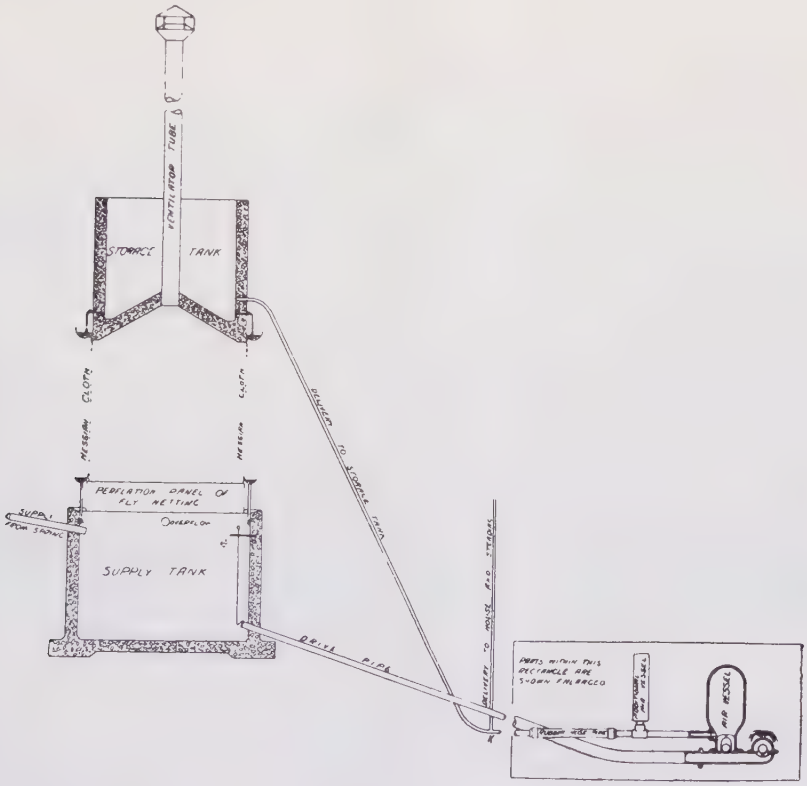


Fig. 6.

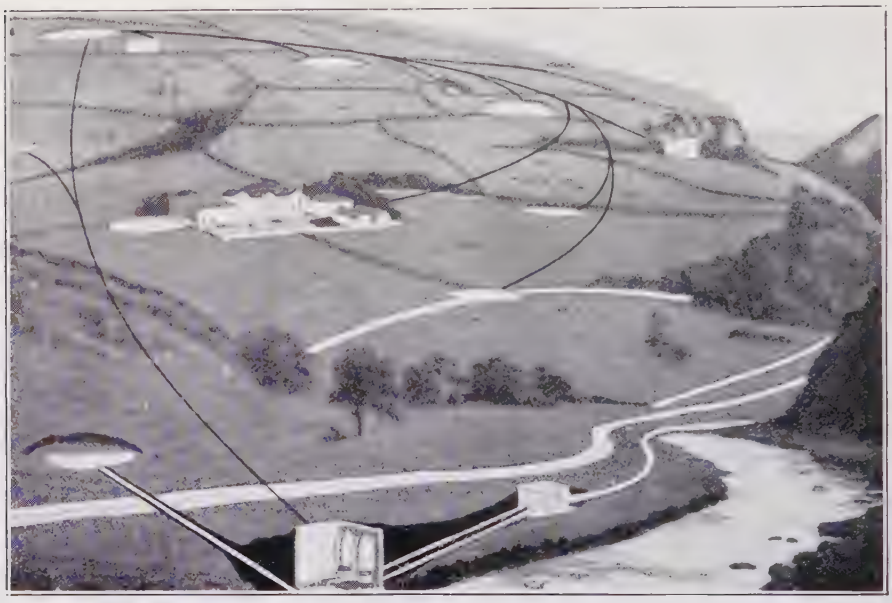
The storage tank is placed vertically above the feed tank, and a cool-storage chamber arranged between the two tanks. The cool-storage chamber consists of a framework covered with hessian cloth, over which water from the upper tank trickles, finally falling into the lower tank. The hessian cloth does not extend quite to the bottom of the walls, the lower 9 inches being occupied by a "perflation panel" of fly-netting. The door can be constructed similarly of hessian cloth stretched over a timber framework. The bottom of the upper tank is of pyramidal form, and from the apex a ventilation pipe of considerable length takes off.

Although, as a rule, it is customary to supply the homestead from the storage tank, sometimes, because of convenience or to effect a saving of piping, the pipe leading to the homestead branches off between the ram and the storage tank, as at K (Fig. 6). An objection to such a direct connection between ram and house is, however, that the continual noisy pounding becomes a nuisance. In the scheme under consideration this objection is overcome by the use of an additional air-chamber on

the discharge pipe, and also by the insertion of a piece of rubber hose between the ram and the junction of the pipe leading to the homestead. These devices have been employed at Wortham Farm, near New London, Wis., where it was found that the additional cushion furnished by the extra air-chamber and the flexibility of the hosepipe completely destroyed the propagation of sound.

Plan of a Typical Plant.

Fig. 7 is a sketch plan of a typical hydraulic ram installation. The portion of the stream shown has a considerable fall in its length. An open channel or a pipe is taken out of the stream above a weir thrown across the latter for the purpose of raising the water-level above it. This channel or pipe is laid out with only a small fall, much smaller than that of the stream, so that a considerable fall comes to be available between the level of the water in the feed tank and that of the water in the stream where the waste-pipe enters. The drive-pipe, ram, &c., can then be installed as shown.



By courtesy of Messrs. Stewarts and Lloyds.]

FIG. 7.

Rams forcing to a height of 719 feet. Showing a duplicate pair of ' B " Rams worked by impure water, with a fall of only 9 feet, and raising 4,500 gallons of spring water per day to a height of 719 feet, and to a distance of 1,223 yards. These serve a large Horse Stud Farm.

Inquiry Form.—When submitting inquiries, the following information should be furnished by the inquirers:—

(1) The vertical fall (in feet or inches) that can be obtained from the source of supply to the ram.

(2) The vertical height to which the water is to be forced above the level of the ram.

(3) The distance to which the water has to be forced—*i.e.*, the length of the delivery pipe-line.

(4) The approximate quantity of water (in gallons or cubic feet) falling per minute.

(5) The number of gallons required to be raised per day of 24 hours.

(6) The distance in which the working fall is obtained.

Measuring the Driving Water.

Unless the driving water is practically unlimited, it is necessary to measure the flow. An easy method of computing the flow of a *small* spring or stream, is to dam it up temporarily, and in the dam embankment insert a short length of iron pipe to form a spout.

The measurement should be made by two persons—one to take the time and the other to catch the water in a receptacle of known capacity. The time taken to fill the receptacle is noted, and hence the discharge is calculated.

If the flow is rather too much to measure in this way, two, three, or more pipes may be inserted in the dam embankment and when they are all running steadily, the discharge from each in a given time can be measured, as described above. It is not necessary, of course, that each spout should be made to deliver the same quantity.

A flow up to 250 gallons per minute can be measured in this way.

For larger flows, a rectangular gauge notch or weir may be used, as shown in Fig. 8. It consists of a board with a rectangular notch cut out of it to a width of about two-thirds that of the stream immediately above the weir. The bottom and sides of the notch should be bevelled away on the down-stream face, so as to present a more or less sharp edge to the approaching water, or the notch may be cut out of a piece of thin metal, screwed to the board. The notch should be truly rectangular

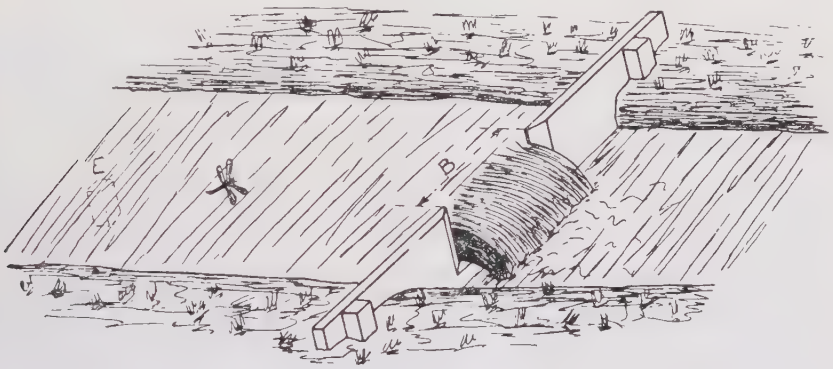


FIG. 8.

and the board or boards that constitute the weir should be let into the banks and bed of the stream and well luted with clay, care being taken to get the bottom or "lip" of the weir horizontal.

A stake "E" is driven into the bed of the stream not less than 3 ft. upstream of the weir, until its top is level with the lip of the weir. This may be done, working with a board with parallel edges and a spirit-level, the board extending from the lip of the weir to the top of the stake and having the spirit-level placed on the top of it. The stake is hammered in till the bubble of the spirit-level comes to mid-run.

A part of the stream should be selected where the water can approach the notch quietly (at a speed of not more than 6 in. per second). Also, the surface of the water down-stream of the weir should be at least 9 in. lower than the lip of the weir.

Measure "B" and "H" (the depth of water above the head of the stake) in inches; then "Q," the discharge of water in cubic feet per minute is calculated from the following formula:—

"Q" (cubic feet per minute) $= 0.4\ BH\sqrt{H}$.

For example, suppose "B" is 36 in. and "H" is found to measure 9 in., then:—

$Q = 0.4 \times 36 \times 9 \times \sqrt{9}$.

$Q = 0.4 \times 36 \times 9 \times 3$.

$Q \times 389$ cubic feet per minute.

Any other case can be dealt with in like manner.

BREEDS OF PIGS.

E. J. SHELTON, H.D.A., Instructor in Pig-Raising.

The first article of this series, "Classification of Pigs," was published in the last Journal. In succeeding issues other breeds of Pigs and matters of moment to Pig raisers generally will be discussed.—Ed.

THE BERKSHIRE OR THE IMPROVED BERKSHIRE.

Of the several breeds of pigs suited to the climatic conditions and to the environment of Queensland, none appear to be so popular or so widely distributed as the Old English Berkshire, also commonly known as the Berkshire, or more recently still as the Improved Berkshire. The type was named after the county in which it was originally developed and bred, and is considered to be the oldest of the improved breeds of pigs.

Historical records away back in the days of 1820 indicate that one Lord Barrington did much to improve this breed, which was at that time of a very much heavier and coarser type than is common nowadays. They were of a vari-coloured type—some were white, some quite black, whilst some were black and white with a large patch of white on the shoulder; some were rough-coated, others fine, and they were not noted for any special characteristics.

Herbert Humphrey was a very successful breeder of the type in 1862, the year when the breed was first given a separate class at agricultural shows, and he was the chief mover in establishing the British Berkshire Society. For over twenty years he compiled the Herd Book and edited its proceedings. Since then breed societies, like the show yard, have exercised a stronger influence on type and quality than any other institution.

Berkshires are undoubtedly the most popular and the most suitable of the dual-purpose types. They were among the first to be improved and, seeing that they are suited not only to the cooler weather conditions prevailing in England, Europe, and America, but to the warmer climates of Africa, the Islands, and Australia, they rapidly become acclimatised and may be adapted to almost any conditions.

The breed possesses a ready aptitude to fatten, either as porkers or baconers, and can be killed to advantage from 4½ to 12 months old, the 6-months-old pigs being the most profitable. It costs more to feed them after they scale 130 lb. dressed, and the bacon-curers class them in a lower grade if too coarse or too heavy.

The Quality of Berkshire Pork and Bacon.

The average quality of Berkshire pork and bacon is such that it can be graded as extra prime. The fat and lean meat are fairly intermixed and of excellent quality. The pigs dress out well in proportion to their live weight. The large and lengthy framed Berkshire with a medium to short head and a fine coat of hair is much sought after. These are noted for early maturity, quick growth, and for prolificacy—three very desirable characteristics in any breed of pig.

The report of the British Berkshire Society states that the chief characteristics of the breed are their hardiness, active disposition, general conformation, and their evenly developed carcass, whilst as a breed they are unsurpassed as grazers and foragers. As a result of their strong digestive and assimilative powers their increase in weight is large in proportion to the amount of food consumed.

Their Early History.

It is recognised, of course, that Chinese, Neapolitan, and perhaps also Siamese pigs were used for mating with the Old English wild pig to form the foundation of the new type, and doubtless the prepotency of the Old Chinese type (which was white) has been handed down through the ages of improvement. The older types of Berkshire, as illustrated in a very old oil painting in possession of the Agricultural Department of the University of Edinburgh, shows the breed as of a chestnut colour with dark patches through the hair. Russet-coloured spots were common, and these still appear in Berkshires that show a tendency to degenerate. The colour comes out very strongly in second and third crosses of these types.

The Journal called "The Complete Grazier," in an issue of 1845, describes the breed after it had been materially improved from the standard of the earlier days, as in colour reddish-brown, with brown or black spots, sides very broad, legs flat, ears large and pendulous over eyes, body thick, close, and well made.

PLATE 102.—A GROUP OF SELECTED BERKSHIRE BROOD SOWS.
Sows of this description always realise good values in normal seasons, and are worth especial care.

PLATE 103.—A CHAMPION BERKSHIRE BOAR FROM THE STUD OF A. C. STEWART, PRESIDENT OF THE BERKSHIRE AND YORKSHIRE FEDERAL GENERAL COUNCIL OF AUSTRALASIA.

This Boar, "Goomalibee Colonel," is a noted prize-winner.

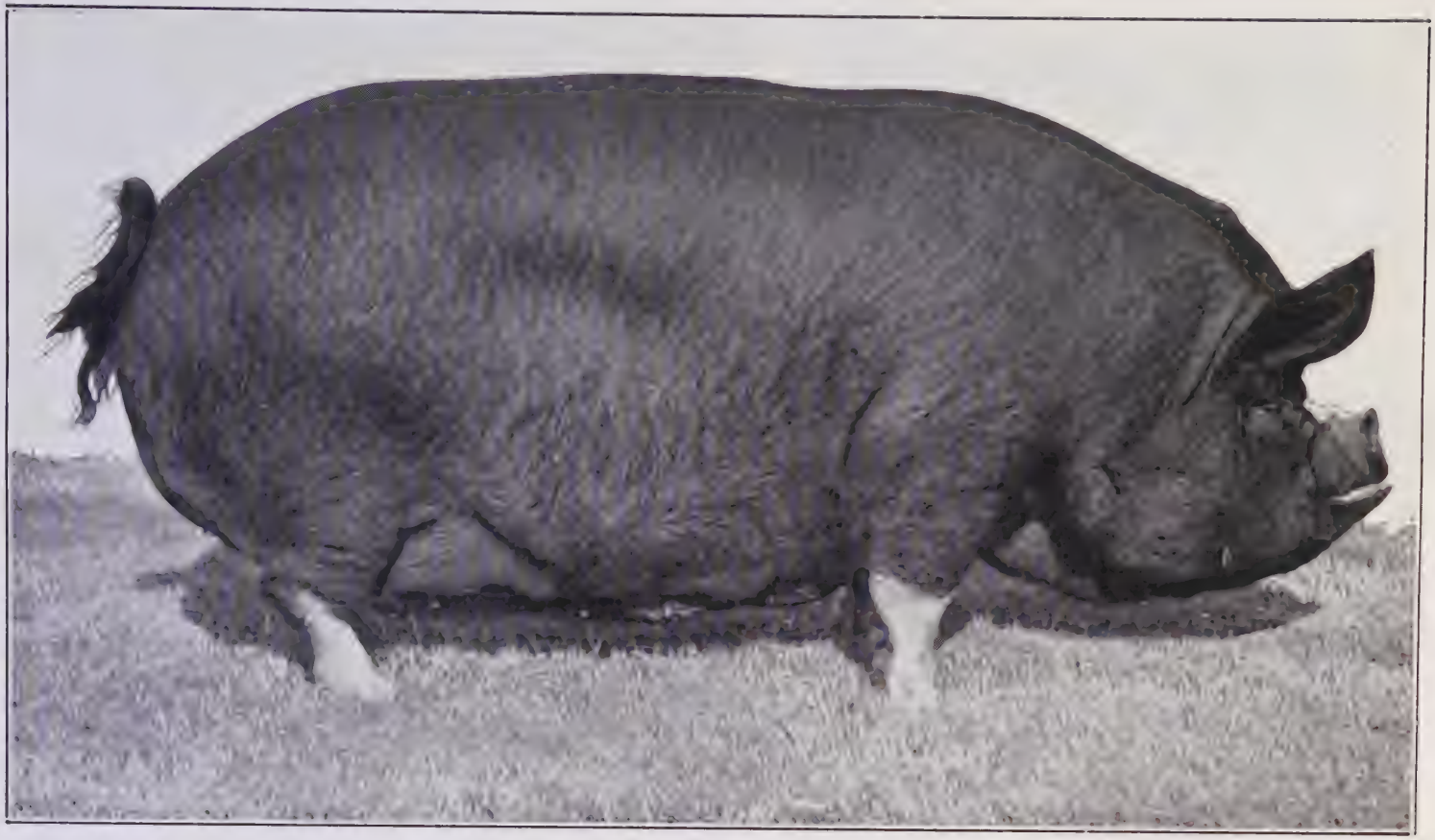


PLATE 106.—BERKSHIRE SOW "BRENTWOOD DOROTHY,"

Property of McPhee, Bros., of the Clarence River, N.S.W. A Champion prize winner of excellent type. Note her length, depth, and compactness.

The Modern or Improved Type of Berkshire.

There can be no denying the fact that the Berkshire has undergone more changes in type under the influence of the showyard in recent years than any other breed of pig which has been recognised in prize schedules for an equal length of time. There never was a time when quality and type was more keenly sought after and obtained by the breeder than now. There is no call nowadays for the long-nosed, rough-coated type of years ago.

Prominent amongst the characteristics for which the Berkshire is noted are:—

(1) Great muscular power and vitality, which renders them less liable to disease than any other breed. The boars are prepotent to a degree; the sows are fairly prolific.

(2) Activity, combined with strong digestive and assimilative powers; hence Berkshires return a maximum of flesh and fat for the food they consume. They are good "doers."

(3) The sows are careful nurses and good sucklers, and all are excellent grazers. They possess good limbs, and good-quality, fine, flat bone.

(4) The young pigs are strong, smart, and active at birth, consequently are less liable to mishap.

(5) They can be fattened for market at any time, whilst they can be fed to any reasonable weight desired.

(6) The flesh provides a high-quality pork and bacon much sought after, both by pork-buyers and bacon-curers.

(7) The Berkshire boar possesses remarkable powers in transmitting the valuable qualities of the breed to his progeny when used as a cross. This power is called "prepotency." No breed has been used more extensively for cross-breeding purposes or has been found so useful for refining the progeny of coarser types.

(8) Berkshires possess unsurpassed uniformity in colour markings and quality. They reproduce themselves faithfully. Their reasonable size, quick growth, and easy fattening powers, with uniformity and hardiness, make them a favourite with breeders of pigs generally.

The Modern Type.

The modern—or, as it is frequently erroneously styled, the "improved" Berkshire—is medium in size, trim, and free from roughness. They are well modelled and possess the very necessary length and depth of body and hams. The face is short and dished, the ears fine and erect and slightly pointed; the hair thick and fine, according to type, without "swirls" or "roses" (both faults in the showyard). To the pig fancier the modern Berkshire has a captivating and symmetrical outline.

When slaughtered, Berkshire flesh has a fine texture with the proper proportion of fat and lean. The meat is sweet and of good flavour. This is the result of quick growth and early maturity.

Both boars and sows have an excellent disposition; they are quiet, docile, and contented, and it is uncommon to find a bad-tempered fence-breaker amongst them.

The breed is fairly prolific under local conditions, and this characteristic can be distinctly improved by careful selection and breeding. In-and-in breeding, breeding too closely, and neglect soon tell their tale in reduced and irregular breeding powers. This also lowers the standard of quality and causes the animals to be classed as "slow growers."

Both the fine- and the thick-haired types do well here. The former or a medium type is the more popular.

The Breed Societies.

Following on after the formation of the British Berkshire Society in 1845, the American Berkshire Association in 1875, the National Berkshire Record in 1893, and the Berkshire and Yorkshire Society of Australasia in 1900 were organised. This has resulted in an extensive distribution of the type throughout the world. To-day in Australasia they stand at the head of the list as being most easily adapted to any climate, soil, or condition, and will reproduce with equal facility and quality both for pork and bacon.

The Berkshire as a Breeder.

The Berkshire sow makes an excellent, contented mother—sturdy, vigorous, and thrifty, cleanly in habit (if given a chance to be so), fairly prolific, averaging from 8 to 10 pigs reared per litter. The suckers when born are lively, sturdy, keen, and develop rapidly.

Plate 107.—A Popular Type of Berkshire.
Note the full development of udder and teat. This Sow would produce large quantities of milk, and thus be able to suckle a large litter.

Plate 108.
This Berkshire Sow shows a wonderful development of udder and teats. She was a proved breeder of first-class Pigs.

Sows should not be retained as breeders when over seven or eight years of age, as they lose their teeth and often become very clumsy and poor sucklers. They can, of course, be fattened and marketed as back-fatters if food is reasonably cheap and plentiful.

If the stock are too finely bred, however, they deteriorate and produce puny litters. The breed exercises a powerful influence in the production of good-typed pigs in country districts. Cross-breeding can thus, by the maintenance of pure, strong, prepotent types, be made of considerable local value.

Berkshire Boars.

Some very high prices have been secured for Berkshire boars abroad. We have record of a genuine Canadian sale of the Berkshire boar "Premier Longfellow," who was champion at St. Louis State Fair in 1916, and at the sales realised £400. The record price in England is £500, whilst Berkshire sows have also topped the sales on many occasions. Stud pigs have never realised these prices in Australasia, but from 50 to 75 guineas each has been paid on several occasions in New South Wales and Victoria for selected animals.

A few years ago it was considered that the Berkshire was much superior to any other breed in prolificacy, but many breeders, taking advantage of the opportunities at auction sales of stud pigs and in show ring, have followed a system of excessively fattening their animals. This has in some instances resulted in a loss of refinement and quality in the young stock, and a still more serious defect in the loss of hereditary prepotency.

It has been truly said that the "pig is what the breeder and feeder make it."

The show yard winner of to-day is, unfortunately, often a short, chubby, unprofitable animal with an unnatural obesity, thick heavy forequarters, and poor breeding powers.

Herd Book Standards.

One breed may rise—another fall,
The Berkshire breed survives them all.

The principal points of the Berkshire breed, as set out in the Herd Book standards of the British Berkshire Society, are as follows:—

Colour.—Black with white blaze on the face. Four white feet, and white flag on the end of the tail.

Head.—Of medium size, broad between the eyes and ears, with an even and well-dished face, broad and fleshy.

Eyes.—Bright, kindly, and intelligent; dark hazel or grey in colour.

Ears.—Thin, pricked or cocked, inclined slightly forward, and fringed with fine silky hair.

Jowl.—Full, clean, light, and running well into the neck.

Neck.—Short, muscular, and broad.

Chest.—Wide, deep, and full, with good girth.

Back.—Long, straight, or slightly arched, with well-sprung, broad ribs.

Sides.—Deep and well let down, with even and level underline.

Loin.—Full and wide, powerful, and not drooping.

Belly.—Full, round, and with at least twelve teats.

Flank.—Thick, well back, and reaching down on to leg.

Quarters.—Wide and lengthy, set well away from the tail.

Hams.—Broad, long, deep, and fleshy down to the hock.

Tail.—Fine, tapering, short, and well set up; nearly level with the back.

Legs and Feet.—Short, straight, strong, with flinty flat bone, set wide apart. Hoofs nearly straight, firm, and compact.

Pastens.—Short and springy.

Skin.—Smooth, pliant, scurfless, and free from wrinkles.

Hair.—Plentiful, fine, soft, and with a tendency to thickness.

Objections.—Objections are a perfectly black face, foot, or tail, a "rose" back, white or sandy spots on the body, a white ear, a very coarse mane, and inbent knees. Rupture in the case of a boar or only one testicle let down, and in sows irregularly placed or blind teats.

REPORT ON EGG-LAYING COMPETITION—QUEENSLAND AGRICULTURAL COLLEGE, OCTOBER, 1923.

The weather somewhat improved since issue of last report, and the laying of the birds has been practically the same, with the exception that broodiness has been on the increase, especially among the leading teams of the heavy breeds. The best scores for the month in the light breeds were those of Messrs. W. and G. W. Hindes 162, and Mr. N. A. Singer with 159 eggs. In the heavy breeds Mr. Jas. Potter scored 145 and Mrs. A. E. Gallagher 144 eggs. Mr. R. Burns replaced his F bird, the original competitor having been destroyed for oviduct trouble. Results :—

Competitors.	Breed.	Oct.	Total.
LIGHT BREEDS.			
*C. H. Singer	White Leghorns	158	950
*W. and G. W. Hindes	Do.	162	932
*N. A. Singer	Do.	159	924
*Oakleigh Poultry Farm	Do.	156	856
*Ancona Club	Anconas	134	827
*S. L. Grenier	White Leghorns	127	812
*Beckley Poultry Farm	Do.	137	787
*H. P. Clarke	Do.	150	776
*Rock View Poultry Farm	Do.	128	770
*Mrs. L. Andersen	Do.	130	770
*J. W. Newton	Do.	142	770
F. Sparsholt	Do.	122	759
*O. Goos	Do.	123	758
*R. C. J. Turner	Do.	137	755
*J. M. Manson	Do.	125	747
*Geo. Williams	Do.	132	735
*J. W. Short	Do.	123	727
*Bathurst Poultry Farm	Do.	122	719
*Arch. Neil	Do.	126	718
*C. A. Goos	Do.	130	707
Jas. Hutton	Do.	108	705
*Mrs. R. E. Hodge	Do.	126	695
G. Marks	Do.	119	693
*A. C. G. Wenck	Do.	123	686
G. E. Rogers	Do.	113	668
*H. Fraser	Do.	111	662
*J. Purnell	Do.	133	649
W. Becker	Do.	116	645
W. A. and J. Pitkeathly	Do.	116	645
J. Harrington	Do.	101	640
C. Quesnell	Do.	116	623
W. and G. W. Hindes	Brown Leghorns	108	610
E. Ainscough	White Leghorns	123	610
Jas. Earl	Do.	107	603
Chapman and Hill	Do.	108	603
*N. J. Nairn	Do.	127	592
*Mrs. E. White	Do.	105	589
Parisian Poultry Farm	Do.	114	568
HEAVY BREEDS.			
*W. Becker	Chinese Langshans	132	867
*R. Burns	Black Orpingtons	140	867
*Jas. Potter	Do.	145	849
*Jas. Ferguson	Chinese Langshans	136	839
*Mrs. A. E. Gallagher	Black Orpingtons	144	823
*Jas Hutton	Do.	124	802
J. R. Douglas	Do.	122	763
*Mrs. A. Kent	Do.	135	762
*Parisian Poultry Farm	Do.	139	761

EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE—*continued.*

Competitors.	Breed.	Oct.	Total.
HEAVY BREEDS—*continued.*			
*E. Walters	Black Orpingtons	126	757
*T. Hindley	Do.	136	743
*E. F. Dennis	Do.	119	736
W. T. Solman	Do.	124	729
*R. Holmes	Do.	122	716
*H. M. Chaille	Do.	107	711
R. Conochie	Do.	109	700
*J. H. Jones	White Wyandottes	122	674
*C. C. Dennis	Black Orpingtons	120	673
Beckley Poultry Yards	Do.	107	664
G. E. Rogers	Do.	113	663
Rev. A. McAllister	Do.	117	649
H. B. Stephens	Do.	124	641
W. F. Ruhl	Do.	103	627
Jas. Ferguson	Plymouth Rocks	101	609
W. G. Badcock	Chinese Langshans	103	581
V. J. Rye	Black Orpingtons	100	565
F. J. Murphy	Do.	117	519
Jas. Ferguson	Rhode Island Reds	100	464
Mos. Stephens	Black Orpingtons	95	437
Totals		8,279	47,476

* Indicates that the pen is being tested singly.

DETAILS OF SINGLE HEN PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
C. H. Singer	143	193	158	139	152	165	950
W. and G. W. Hindes	141	163	148	141	170	169	932
N. A. Singer	139	162	170	161	147	145	924
Oakleigh Poultry Farm	156	150	133	135	151	131	856
Ancona Club	128	145	168	112	129	145	827
S. L. Grenier	123	139	149	133	140	128	812
Beckley Poultry Farm	136	118	111	136	144	142	787
H. P. Clarke	141	101	142	122	138	132	776
Rockview Poultry Farm	138	149	131	127	109	116	770
Mrs. L. Andersen	103	137	142	141	123	124	770
J. W. Newton	139	135	122	107	130	137	770
O. Goos	112	133	139	127	117	130	758
R. C. J. Turner	122	129	124	125	114	141	755
J. M. Manson	119	114	143	145	122	104	747
Geo. Williams	138	140	109	112	126	110	735
J. W. Short	122	118	123	130	129	105	727
Bathurst Poultry Farm	124	124	105	133	124	109	719
Arch Neil	106	122	100	136	139	115	718
C. A. Goos	121	135	98	125	108	120	707
Mrs. R. E. Hodge	110	118	108	128	122	109	695
A. C. G. Wenck	118	104	108	118	107	131	686
H. Fraser	119	104	108	108	112	111	662
J. Purnell	112	104	113	98	123	99	649
N. J. Nairn	109	80	109	101	97	96	592
Mrs. E. White	80	100	117	110	101	81	589

DETAILS OF SINGLE HEN PENS—*continued.*

Competitors.	A.	B.	C.	D.	E.	F.	Total.
HEAVY BREEDS.							
W. Becker	148	155	156	144	139	125	867
R. Burns	151	135	140	132	196	113	867
Jas. Potter	127	157	124	137	133	161	849
Jas. Ferguson	150	156	135	128	131	139	839
Mrs. A. E. Gallagher	131	144	139	139	133	137	823
Jas. Hutton	142	140	139	130	131	120	802
Mrs. A. Kent	114	159	109	160	114	106	762
Parisian Poultry Farm	96	125	128	143	138	131	761
E. Walters	151	151	115	111	115	114	757
T. Hindley	127	138	140	133	108	97	743
E. F. Dennis	134	135	117	116	116	118	736
R. Holmes	105	104	124	118	129	136	716
H. M. Chaille	110	140	128	125	100	108	711
J. H. Jones	115	125	123	112	84	115	674
C. C. Dennis	118	126	84	119	112	114	673

TRUENESS TO TYPE.

	Class.	
LIGHT BREEDS.		
S. L. Grenier	I.	Good type and stamina; A a poor feeder.
H. P. Clarke	I.	Good type, stamina, and size.
G. Williams	II.	Good type and stamina, with the exception of B, which is of poor type.
W. and G. W. Hinds ..	I.	Good type and stamina; a splendid team; good workers.
C. H. Singer	I.	Good type and stamina; F a little on the small side.
H. Fraser	I.	A fair team; F a little on the light side.
Arch. Neil	I.	A fair team; F somewhat too blocky.
J. A. Manson	I.	Good type and stamina.
Mrs. R. Hodge	I.	Good type and size; plenty of weight.
N. J. Nairn	I.	Fair type; somewhat slow feeders.
J. W. Short	I.	Good type and stamina; F rather too much headgear.
Bathurst Poultry Farm	I.	A fair team; just passes.
A. G. C. Wenck ..	I.	A fair team; E rather too much comb.
C. A. Goos	I.	Good type and stamina; good length of back.
J. Purnell	I.	A good team, of fair type.
L. Andersen	I.	Good stamina; fair type.
O. Goos	I.	A fair team; E rather nice type.
Rockview Poultry Farm	I.	A good team, and good size.
Mrs. E. White	I.	Good type and size; slow feeders.
Ancona Club	I.	Good type and stamina; rather a smart team.
R. C. J. Turner ..	I.	Good type and stamina; size good.
Beckley Poultry Farm	I.	Good type and stamina.
J. W. Newton	I.	Good type and stamina; A bird somewhat small across shoulders.
Oakleigh Poultry Farm	I.	Good type; splendid team.
N. A. Singer	I.	A good team; D would be better for a little more size.
Jas. Earl	I.	Good type and stamina.
G. Marks	I.	A fair team; could do with less headgear.
Jas. Harrington ..	I.	Good stamina; a very fine team.
Parisian Poultry Farm	I.	Good stamina; F bird good quality.
W. A. and J. Pitkeathly	I.	Fair type; good stamina; A high tail carriage.
C. Quesnell	I.	Good stamina and type; D a good bird.

TRUENESS TO TYPE—*continued.*

—	Class.	—
		LIGHT BREEDS—*continued.*
W. and G.W. Hinds (B.L.)	I.	A nice team; good stamina.
W. Becker	I.	Good type and stamina; F the best bird.
G. E. Rogers	I.	A fair team; good stamina; passable type.
E Ainscough	I.	Good type; C rather high in comb.
F. Sparsholt	II.	Differing in type; on small side; good stamina.
Chapman and Hill ..	II.	A fair team; F bird too narrow across shoulders, and poor stamina.
Jas. Hutton	I.	Good stamina, fair type, somewhat high on legs.
		HEAVY BREEDS.
J. H. Jones	I.	Good type and stamina.
E. Walters	I.	Fair type; A and B fine birds; good eyes.
Jas. Potter	I.	Good type; would be better for more size; just pass.
Parisian Poultry Farm	I.	A good all-round team.
Jas. Ferguson	I.	Nice type; good stamina.
R. Holmes	I.	Good type; fair workers.
Jas. Hutton	I.	A splendid team; nice heads and eyes.
R. Burns	I.	Good type and stamina; E rather short in leg, but a splendid worker; good head and eye.
Mrs. A. E. Gallagher ..	I.	A fair team; good stamina.
E. F. Dennis	I.	Fair type and stamina; A not so good in type.
T. Hindly	I.	Good type and size; nice team.
C. C. Dennis	II.	Type poor; D bird small and of poor type.
Mrs. A. Kent	I.	A fair team; good stamina and size.
H. M. Chaille	I.	Good type; plenty of size and stamina.
W. Becker	I.	Good type; fair stamina; E rather light in eye.
R. Conochie	I.	Good type and stamina; C splendid type for a layer.
J. Ferguson (R. I. Reds)	I.	A fair team; good stamina; rather light eyes; C the best bird.
W. G. Badcock ..	I.	Good type and stamina.
Mos. Stephens	I.	A fair team; D the best type.
G. E. Rogers	I.	A fair team; C rather high tail carriage.
F. J. Murphy	I.	Fair type; good stamina; passable team.
H. B. Stephens	I.	A fair team; good stamina and size.
Beckley Poultry Farm	I.	A fair team; passable type.
V. J. Rye	II.	Five birds; good stamina, and fine type; E poor type, and small.
J. Ferguson (Ply. Rocks)	I.	Good type; good even team; A a fine bird.
W. G. Solman	I.	Good stamina; type passable; rather high tail carriage.
Rev. A. McAllister ..	I.	Good type and stamina; fine size.
W. F. Ruhl	I.	Good type; plenty of size.
J. R. Douglas	I.	A fair team; good size and stamina.

P. M. PITT, Acting Principal.

QUEENSLAND TREES.

By C. T. WHITE, Government Botanist, and W. D. FRANCIS, Assistant Botanist.

The Ribbonwood (*Euroschinus falcatus*) is a large rain-forest or scrub tree attaining a height of about 130 feet and a trunk diameter of about 3 feet. The stem is often buttressed at the base in the large trees. The bark is brown and somewhat scaly, and sometimes slightly wrinkled. When the bark is cut it is seen to be brownish-pink in colour. The trees grow in the coastal rain forests from the Hastings River, New South Wales (Bentham), to the Endeavour River in North Queensland. They are found as far inland in Queensland as Bunya Mountains in the South and Stannary Hills in the North. The timber is pale brown in colour, light in weight, and pleasingly marked. It should be a good timber for cabinetwork and indoor fittings.

Photo. by the Authors.]

Plate 109.—The Ribbonwood (*Euroschinus falcatus*).
A Tree in the Imbil Rain Forests.

Photo. by Department of Agriculture and Stock.]

PLATE 110.—THE RIBBONWOOD.

OUR NATURAL GRASSES.*

Australia is particularly fortunate in possessing such a grand variety of indigenous grasses and bushes on which live stock thrive so well. Possibly no other country in the world is so well provided for in this respect as the Commonwealth. The different species of native grasses of Australia number over 350, and, compared with her neighbouring States, Queensland has far more than her share of these magnificent grasses. The average person can hardly realise to what extent the pastoral industry of Queensland is dependent upon her Mitchell, Flinders, Blue, Kangaroo, and many other varieties of native grasses.

Kangaroo Grass.

Perhaps of all the natural grasses of Australia, the *Anthistiria ciliata* (Kangaroo grass) is the most valuable, on account of the wide range of country over which it is spread. It is held particularly in high esteem in the latitudes south of Queensland, where in summer it provides fine, nutritious feed for stock. If the weather proves favourable it supplies green herbage right into the autumn. The brown colour usually assumed by kangaroo grass at that period of the year may leave the impression upon the casual observer that the grass has then lost its nutritive properties, whereas in truth it is at its best, the large seed heads, so distinctive a feature of this particular grass, having fine fattening qualities. All classes of live stock are particularly fond of the grass, with the result that it is liable to be "eaten out" if the stock are kept upon it for too long a period, and especially so if sheep comprise the live stock, as they crop it down so closely. Evidence of this is seen frequently along the enclosures of railway lines, where kangaroo grass can often be observed, waving its heads over the top of the fencing, while adjoining paddocks have been completely denuded of it. Those settlers who appraise it at its true value are careful to observe that the pastures are not overtaxed from the time it vegetates in the spring until the flowering stage in December has passed. It likes good drainage, and appears to revel on a gradually sloping hillside. Stock in Queensland do not eat it with that avidity so noticeable in southern latitudes, but possibly this is due to the form here appearing somewhat coarser. The stems of this grass in Queensland can be seen growing to 5 feet high. The leaves are narrow, and the grass grows in tussocks, which are of wider spread in the Southern States as compared with the Northern parts. It belongs to the Andropogon tribe of grasses, of which Queensland possesses many valuable varieties.

Blue Grass.

One of the best is *Andropogon sericeus* (blue grass), which grows from 2 to 4 feet high. The tussock it forms is leafy, with a bluish-green tint, the stems being numerous and erect, with a branching habit at the base. It is held in such high repute for fattening purposes that many graziers neglect to let it seed every few years, as is necessary, with the result that in parts is has become almost eaten out. Being a lover of rich lands, it is seldom met with on the poorer classes of soil, although, to compensate for this, as it were, its near relative, *Andropogon affinis*, is found usually on poor, dry land. Another of Queensland's Andropogons is the *refractus* (broken spiked grass), of bluish-green colour, which attains a height of from 2 to 4 feet. It is one of the most common grasses of Queensland, and, despite being rather coarse, provides a large quantity of summer feed.

Mitchell Grasses.

One of the grasses that has helped considerably in making the name of the Warrego district well and widely known as good sheep and cattle country is the *Neurachne Mitchelliana* (mulga grass), possessing knotty stems, of a creeping habit, which send up erect branches. It is alleged to have derived the name of "mulga grass" from the natives, who called it after a species of acacia of that name. It keeps up a growth of grass after other sorts have disappeared. The *Astrebla pectinata* (coarse Mitchell grass), grows erect from 1 to 2 feet high, being a valuable pasture grass. *Danthonia pectinata*, another Mitchell grass, is of coarser and more upright growth than the other. The well-known Roley-Poley grass (*Panicum macractinium*) is to be found on rich downs, and on poor sandy ridges. Its stems, from a spreading base, reach from 1 to 3 feet high, providing excellent bottom feed. The panicles when dry, become very brittle, and snap off easily, with the result that the wind-borne tops of this grass can at times be seen piled against wire-netting fencing to its complete height, and one may easily imagine what would happen to the fencing were a fire to occur.

* "The Queenslander," 24/11/23.

Panick Grasses.

In the northern parts great numbers of birds live on the seeds of the valuable Panick grasses, and, in the pioneering days, the natives used to pound the seed into a kind of coarse flour, from which they made cakes. One of the most notable of these is *Panicum crus-galli* (the large cocksfoot, or "barnyard" grass), which ranges from 2 to 6 feet in height, having broad leaves with dense panicle. It is a succulent grass, which sometimes is sown in damp situations, for cutting, like sorghum, for dairy cattle, as when cut early it makes a good second growth. Horses in particular are fond of this fodder. The *Panicum flavidum* (Van Dyke grass), which provides a large quantity of succulent feed, flourishes well on the high lands around Brisbane, and is widely distributed, growing remarkably well beyond Springsure. *Panicum leucophæum* (weeping cotton grass) is prolific, both as regards seed and herbage, and, although its favourite soil is a sandy loam, it is even found on poor, dry soils.

Judgment Needed.

The seeds of the Stipa grasses are awned, and adhering to the wool of the sheep, often force their way beneath the skin, occasionally causing death by penetrating the vital organs. Many a grazier can prevent his wool being damaged in value by masses of seed prickles becoming entangled therewith by placing his sheep in paddocks where there is only a comparatively short growth of grass before shearing time arrives. The owners of some stations arrange their shearing to take place before the time the grass seeds have sufficiently developed to become a serious nuisance.

Drought Resisters.

No imported grasses have proved the equal of the native herbage in resisting the drought conditions that are liable to prevail in Australia. It is remarkable how well and long our indigenous grasses cling to life, even in the central parts of the continent, under most adverse conditions, and a good season, after a drought, has often been sufficient to convert vast, dry, barren areas into a land of great promise with its prolific crops of natural grasses.

Queensland's Great Wealth in Natural Pastures.

The nutritive qualities of the Queensland herbage has been the cause of much astonishment to people from the South, especially those who previously only had knowledge of the soft, winter coastal grasses, and upon which alone no man would dream of expecting his horse to perform hard dray-work. Consequently they much appreciate seeing teams of both horses and bullocks, drawing heavy loads of wool from the stations to the railways, keep in wonderfully prime condition by feeding on the native grasses at night, after the day's heavy work. The general experience has been to find more nutriment in the grasses growing inland than in those flourishing in the coastal areas. Cattle, which, owing to adverse seasons, have been removed from southern parts of New South Wales and Northern Victoria, to Gippsland, have taken months to regain their condition, whereas ragged-looking cattle from Gippsland, when transferred to Northern Victoria, have become fat in a remarkably short period. The Royal National Association, in a praiseworthy manner, has set aside a small area for grass plots at the Exhibition grounds, and, with a possible extention of this reserve, in time much good is likely to result because a large number of men who are closely associated with the land are unable to distinguish good from worthless grasses.

THE 1923 SUGAR SEASON.

Due to the excellent crops in North Queensland above Townsville, and the high percentage of sugar in the cane there, the yield of sugar for the present season is now likely to be a good deal higher than was anticipated in June last. Although, due to the severe drought, most of the Southern mills have only had a short season and failed to realise their earlier estimates, the more Northern mills have been harvesting heavier crops than they at first expected, and some of these mills will have to go well into January before cutting out. From the estimates recently furnished to the Director of Sugar Experiment Stations (Mr. H. T. Easterby) by the various Queensland sugar-mills, it now appears likely that a yield of 260,000 tons of sugar may be produced, that is if the mills are able to crush all the cane they expect. This will, of course, largely depend on the remainder of the season.

This, with a production in New South Wales of, say, 17,000 tons, and in Victoria (beet) of 2,700 tons, will give a production for Australia of 279,700 tons, which should about meet the consumption if Queensland's present estimate is finally realised.

THE WELFARE OF COUNTRY WOMEN.

Points from a paper on "Women in the Tropics," read at a recent Conference at Charters Towers, under the auspices of the Queensland Country Women's Association, by Dr. Phyllis Cilento, of Townsville.

One of the great disadvantages experienced by women, especially in outlying parts, is the isolation, with the consequent feeling of mental stagnation; the lack of good books, pictures, good music, or plays; and the limited circle of friends who, though appreciated, do not afford the stimulus of a wider circle of acquaintances with a wider range of interests. In the towns, too, this is noticeable, for even a town of the size of Townsville has no public reading library where information can be obtained; no pictures or even prints of the masters, for the education of both young and old. The sense of being "out of things" and caught in a backwash of civilisation breeds more discontent and restlessness among women than even material hardship. Such discontent and restlessness militates more than any other factor against improvement in the conditions of women, and yet is a direct effect of the conditions. It results in an unwillingness to make their homes in the North, and a constant looking southwards for all good things. They consequently grumble at the inconveniences and disabilities they suffer in the North, without doing a hand's turn to improve their lot. It never will be better unless there is loyalty to the land of their birth or adoption among its women, and this is the spirit which the Country Women's Association is trying to foster. Instead of grumbling, we are trying, not to "make the best of a bad job," but to make the best of "the very splendid job" that Nature has made ready for us in North Queensland.

Needs.

Having considered these disabilities under which we suffer, I would sum up our more urgent needs to make the life of women and children in the North not only more healthy and comfortable but as attractive as the environment warrants as follows:—

1. Better housing.
2. Education in the matter of how to live in the Tropics, as regards housing, house sanitation and ventilation, labour-saving devices, domestic economy, diet, clothing, and prevention of disease.
3. More maternity hospitals or wards, with ante- and post-natal clinics, baby- and child-nursing centres; and an organised nursing system for bush districts.
4. Cheaper fares and holiday camps for families, and the opening of "hill stations" in suitable mountain sites.
5. Cheaper and more certain supply of fruit, vegetables, eggs, and milk, &c.
6. Propagation of a sense of fellowship, unity, and loyalty among all the women of the North, and through this to provide an opportunity for closer touch with the outside world.

Recommendations.

Amongst the resolutions formed at the previous conference we find many of considerable importance. Thus emphasis is placed on the increase of facilities for country women and their families to reach seaports and pleasure resorts or holiday grounds; for increased training in details of use in domestic and commercial life; increase of scholarship facilities and equal opportunities for men and for women; for the institution of cottage hospitals, maternity wards, baby clinics, creches and kindergartens, and provision of many of the things which add comfort and even luxury to life, and tend to compensate the disadvantages of pioneering. It is unnecessary to traverse the field. We are all agreed upon these essentials.

From a medical point of view, however, emphasis must be placed upon certain of their features. It is not enough that you should have proposed a system of maternity hospitals. The country women must be willing to do their part. The Government is not an inexhaustible financial mine, but the country is. If we are serious about these measures we must be prepared to back up the Government pound for pound, or in more scattered districts, £1 in £3. Further, we must be determined not to let this matter rest until country women, with the assistance of the Government, have succeeded in instituting maternity wards, wherever the population is sufficient to warrant a hospital, and must aim at Government subsidisation of all private country maternity homes, subject to there being a minimum fixed fee, a trained staff, and an agreement that procedures shall be open to Government inspection. The same thing may be said of baby clinics, both stationary and travelling, and of creches and kindergartens.

Next to suitable living conditions a place of importance must be given to facilities for rest and recreation, and in this particular more especially to rest-rooms

for women and playgrounds for children. In Port Pirie, South Australia, there was a rubbish dump known as "Jam Tin Park." Lack of facilities for children was canvassed with such efficiency and effect that the whole male population turned out en masse, and in one day transformed an eyesore into what is recognised to be one of the model playgrounds of South Australia. Country women can initiate such measures as this without appealing to Governments, and must be responsible for lack of playgrounds, if they are not willing or capable enough to enthuse their husbands and sons in this regard.

We must aim too, apart from lectures and demonstrations on housing, clothing, infant welfare, and domestic science (essential as these indeed are), at the provision of an increased number of medical officers, both male and female, for more thorough and frequent inspection of schools and school children. We must be prepared, also, not merely to clamour for increased support in this respect, but to second the willing response to their advice, by local drives, &c. These may take the form of—

1. Drives for the elimination in local areas of diseases which have assumed too great a prevalence—for example, diphtheria, typhoid, hookworm, tuberculosis.
2. Local drives for the institution of (*a*) pure water supplies; (*b*) pure milk supplies; (*c*) the destruction of insects which are disease carriers, for example, the blowfly in sheep districts and where eye diseases are prevalent, mosquitoes in localities where malaria and filaria are prominent.

These drives lie entirely within the hands of the local populations. No medical officer, however competent, however enthusiastic, however conscientious, can do anything unless he has behind him public opinion, and in the final analysis public opinion in the country is the opinion of the country women.

One recommendation is that the Government be asked to erect flyproof windows and doors in country schools, and that lectures be given on such subjects as thrift, cleanliness, and hygiene. Such lectures are of practically no use if the child leaves school to return to a home, however clean inside, the surroundings of which are breeding places of innumerable flies, and other foul-breeding and disease-bearing insects.

The Government can, and doubtless will, provide when there is a sufficient demand, competent persons to lecture and demonstrate, but there must undoubtedly be a definite demand and desire on the part of the people in general before it is likely that such an expense will be considered justifiable. In other words, the problem rests in our own hands.

We are all agreed upon the desirableness for assistance and even a programme. The Government can justifiably look to us to put into effect a very large proportion of measures which common sense tells us are necessary.

We are all agreed upon the desirability of being instructed on rational feeding, housing, clothing, sanitation, and labour-saving devices, but are we at the present juncture equally agreed that we could provide in any of the towns we represent, a packed and enthusiastic house to listen to lectures on these subjects? We personally, would perhaps be glad to have pamphlets to distribute to the women of outlying farms, but have we prepared them for the reception of these pamphlets, and if they read them would they follow the advice contained in them? Lectures, pamphlets, and demonstrations are the seeds of progress, but are we sufficiently preparing the soil? Pamphlets suggest talks, and talks suggest letters. There is no better means of getting in touch with remote settlers who so much need assistance, than by means of the book club and similar activities, which can materially assist if we want to, perhaps more easily than in any other way by the institution of a correspondence league, by which activity members living in larger centres could combat the sense of isolation of the women in outlying parts, and stimulate a feeling of fellowship between country women.

Conclusion.

In reading over the resolutions formed at previous conferences, one is struck by the last half dozen recommendations in which the Association pledges itself to do its utmost to arrange for the provision of every kind of facility for the country women. Here, where branches have just been initiated, we cannot do better, I think, than concentrate upon the things which by our very acceptance of membership we have tacitly pledged ourselves to perform. In short, let us for the present do rather than ask. Let us bend our energies rather to a generalised stocktaking of our local needs and resources and the defining of the best way we can set these resources to deal with these needs, rather than to aim at favours obtained entirely from the Government.

Sincerity, where it is rational, produces sympathy. Active sympathy immediately results in progress. With progress and strength we can ask as a right those things which we at present might somewhat vaguely crave as a privilege.

PARALYSIS OF THE HINDQUARTERS IN PIGS.

Paralysis of the hind quarters in pigs is not an uncommon complaint. It is generally considered to be a deficiency disease—that is, some element needed for nutrition is not present in the food.

In answering a question from a farmer recently, the Veterinary Department of the Colorado Agricultural College, U.S.A., stated that the substance in this particular case that was probably lacking was that which had come to be known as Vitamine BA.

A recommendation was made that the farmer try feeding a ration consisting of plenty of milk and carrots.

Results under experimental work with this ration in cases of pig paralysis have been remarkable.

The remedy is a simple one and well worth trial.—E. J. Shelton, H.D.A., Instructor in Pig-Raising.

ROUNDWORMS IN SWINE.

By JOHN LEGG, B.Sc., B.V.Sc., M.R.C.V.S., Government Veterinary Surgeon, Townsville.

The attention of the writer was recently drawn to a parasitic condition occurring in certain swine killed at the abattoirs in Townsville. The particular condition was associated with the presence of deep congestion, with occasionally ulceration of mucous membrane of the stomach, the contents of which when examined were found to contain numerous small nematode worms.

These parasites can only be discovered by a very careful and close search of the stomach contents, and when found are like small, fine red threads which move actively among the ingesta.

Specimens were collected and forwarded to Dr. Georgina Sweet, of Melbourne, and were identified as *Arduenna strongylina* and *Physocephalus sexalatus*, two members of the family Filariidæ. I am also indebted to Dr. Sweet for giving me particulars of these parasites, as they occur in other countries, as well as a complete description of their anatomy.

It is unnecessary to give a complete description of the anatomy of these parasites here, except to say that they are about $\frac{1}{4}$-$\frac{3}{4}$ inches in length, or even slightly longer. The males are smaller than the females, and can be identified by their twisted tails. *Physocephalus sexalatus* is slightly smaller than *Arduenna strongylina*.

From the literature available, the writer can find no record of these parasites as having being reported previously in pigs in Queensland; hence one reason for recording them here. The other reason is that the parasites seem to be of some economic importance. The Slaughtering Inspector at Townsville (Mr. J. A. Rheuben), to whom the writer is indebted for first drawing his attention to this condition, has informed me that the infected animals are invariably in poor condition, and his observations would seem to show that such infected animals do not seem to fatten even under the best of conditions. On examination of the stomachs, as previously mentioned, the surface of the mucous membrane is deeply congested and occasionally shows small ulcers.

These parasites, which appear to be found associated together in other parts of the world as well as here, have been reported from different countries in Europe, and from South America, but have been particularly studied in the United States of America. In the latter country the condition is found frequently associated with marked ulceration of the stomach. Ulceration is apparently not a marked feature of the disease in North Queensland.

The life history of these parasites is unknown.

The discovery of these parasites is a tribute to the energy of the Townsville Inspector of Slaughter-houses (Mr. Rheuben).

As a result of this officer's work during the last two years we have been able to record no less than four hitherto-unknown parasitic conditions of the pig in Queensland.

THE QUEENSLAND SUGAR INDUSTRY.

The Director of Sugar Experiment Stations (Mr. H. T. Easterby) who recently visited the sugar districts of Bundaberg, Mackay, Herbert River, Johnstone River, Babinda, Cairns, and Mossman, has returned to Brisbane. Mr. Easterby's visit was primarily connected with the Sugar Experiment Stations at Bundaberg, Mackay, and South Johnstone, the collection of data for the annual report, the direction of new experiments for the coming season, the securing of a revised estimate for the sugar yield of the present season, and a survey of the industry generally.

Conditions throughout the sugar districts from Bundaberg North were exceptionally dry, and in many places there was a great scarcity of grass and water.

Bundaberg looked fairly green, but crops were on the light side and mills had reduced their previous estimates. On a subsequent visit, made by the Director six weeks later on the way back to Brisbane, it was found that the crop had been even much lighter than anticipated and most of the mills had completed crushing for the season. Some good showers had been experienced, and this district was looking much greener than any sugar district in the North, although the yield of cane was very much poorer.

Herbert River District.

Only about 28 to 30 inches of rain had fallen in this area up to the middle of October. The country was very dry and dusty, but the cane crops were cutting out splendidly and giving a heavy yield. The two mills were getting through the crops rapidly and turning out large quantities of sugar for shipment south. A large area of new land was being put under cane both in the Herbert River district and also between Ingham and Rollingstone. The Colonial Sugar Refining Company evidently intend making a much larger use of Queensland molasses in future, and are erecting a large storage tank at Lucinda Point to supply molasses to their tank steamers for shipment to Sydney. The commercial cane sugar content in the cane is remarkably good on the Herbert River this year, ranging from 15 to 18 per cent. The Haughton sugar mill was taking the surplus cane from Rollingstone to Ingham, but as they only had a small crop the mill ceased operations early in October. The cane on the Herbert River was fairly healthy, but a large amount of gummed cane was visible on the Macknade side of the river, principally in the variety known as Clark's Seedling or H.Q. 426.

Cairns District.

This district was also suffering from droughty conditions, and while the cane was not so green as on the Herbert River, yet crops were cutting out well and the mills were doing good work, although large areas of burnt cane were giving trouble at Mulgrave. The young cane for next year, of which there is a great deal, was looking very fine and generally green. The commercial cane sugar in the cane now being harvested was high. Fortunately little damage had been done by grubs this year. This has been generally attributed to the abnormally dry season. The whole of the Cairns district is most prosperous, and it is apparent that a great future awaits this port.

An interesting experiment plot for testing certain diseases in cane was inspected at the Mulgrave Mill. This is in charge of the chemist, Mr. McBryde, who hopes to secure data in connection with leaf scald. Mosaic disease was noticed in a stool of Clark's Seedling on this plot, for the first time, although it is subject to gumming.

Mossman District.

The cane on this area was also cutting out well in spite of much dry weather and bush fires. Crops of B.147 at the rate of 40 tons per acre were being harvested. This district also presented a most prosperous appearance, and the mill was doing fine work, the average commercial cane sugar in the cane to date being over 15 per cent. The mill authorities are hoping to be able to extend their tramline to the Daintree River, which would add a considerable area to their existing lands. This year Mossman expects to crush 72,000 tons of cane, and new machinery has been added to the existing plant. Scarcely any disease was noticed in the cane, and there were no grubs reported this year in the district.

Babinda.

Large cane fires were breaking out at Babinda in October, and about 4,000 to 5,000 tons of cane were burnt in one fire alone. The Central mill is doing fine work and now expects to cut a much larger tonnage than estimated earlier in this year. In fact, if anticipations are realised there is every probability of this mill turning out 20,000 tons of sugar this year, which would be the largest yield of sugar

ever produced by any one mill in Queensland. The commercial cane sugar is fairly high, very much better than it was some years ago when the land was new and the cane rank. No damage from grubs has been reported. The young cane has an excellent appearance, and the outlook for next year is highly promising. It is anticipated that the mill will cut cane from 8,000 acres this year, and the manager (Mr. A. McColl) stated that a new area of 800 acres of new scrub land was being added to the mill's area.

Innisfail District.

This district, usually the wettest in Australia, was in October perhaps one of the most dusty. The majority of householders and business people were buying water for domestic use, and baths were at a premium. The rainfall from the beginning of the year had only been 78 inches, about half the average, and the condition of the grass was exceedingly dry, but as usual a comparatively dry season suits the Johnstone River, and the cane crop and sugar yield was higher this year than it has ever been previously. Goondi Mill was doing very fine work, and expected 135,000 tons of cane. Crushing at this mill was expected to terminate on the 24th of the present month. South Johnstone Mill was also doing good work, but was badly handicapped by the men refusing duty on Sundays. This was holding the mill back and shortening the weekly tonnage of cane being crushed, which was considerably less than its capacity. This may seriously affect the position towards the end of the crushing, as the South Johnstone Mill has a very large tonnage to deal with and will have to crush well into January. Many growers are uneasy as to whether they will get all their cane cut this year. A good deal of burning is also taking place.

The average commercial cane sugar in the cane at Mourilyan was 15.4 to the end of October. This mill commenced work somewhat late, due to waiting for new machinery. The improvements carried out include new carrier, new crushing mill, electric gantry, and large new sugar-store. The carrier is designed to handle cane by the tipping of the trucks on to the movable platform, and so do away with the usual machine unloaders. The management say the scheme is economical and is working satisfactorily. Altogether upwards of £50,000 had been spent last year in mill improvements, and further additions are yet to be made.

Innisfail has earned the name of the "Million-pound town," but this year if all the mills crush to their estimates the value of the sugar produced should approach £1,300,000.

Should good rains fall in the immediate future there should be a tremendous crop next season. The young cane has made a splendid strike everywhere and looks beautiful.

Tully River.

This new cane-district is presenting a scene of great activity. Farmers are busy clearing their new holdings preparatory to planting cane. A number of sales have taken place, and there is already a considerable population and four stores. The mill site is being cleared, and preparations are being made for the building of the mill's buildings. It is understood that the construction work will be in the hands of Messrs. Barbat and Sons, of Ipswich, who will act for Walkers Limited in the erection work.

Mackay District.

This district was suffering severely from the prolonged dry weather. The rainfall last year was only half the average, and has been followed by a very dry time in 1923. The crops have cut out much below the average, and small tonnages have been experienced at all the district mills. The young cane is holding out well at present, and provided good rains fall within the next month should not get very far behind. All growers are hoping earnestly for a beneficial downpour, which it is hoped will speedily come to their relief.

The sugar yield in Mackay will probably be about 34,000 tons this season. An irrigation plant is being installed by one of the leading growers.

Summary.

While all the districts south of Townsville, except Nambour, have suffered more or less severely from the extremely dry weather, and the yield of cane has been comparatively low, the districts above Townsville have experienced a splendid season, the crops of cane being high and the yield of sugar exceptionally good. Most of these Northern mills have substantially increased their estimates during the last two or three months, so that it is confidently hoped that the much larger yield in the North will make up for the deficiency in the output south of Townsville.

A revised estimate of the anticipated sugar yield for this season will be issued in a few days.

THE PURE SEEDS ACTS, 1913-1914, EXPLAINED.

By F. F. COLEMAN, Officer in Charge, Seeds, Fertilisers, and Stock Foods Investigation Branch, Department of Agriculture and Stock.

Both buyers and sellers of seeds would do well to make themselves acquainted with the Regulations now in force, which are as follows:—

1. In these Regulations, unless the context otherwise indicates, the following terms shall have the following meanings respectively:—

Definition of vendor.

(*a*) "Vendor"—Any person who sells or offers or exposes for sale, or contracts or agrees to sell or deliver any seeds.

Definition of foreign ingredients.

(*b*) "Foreign ingredients" shall include inert matter, seeds of weeds, and seeds of any kind other than the seeds in question; or dead, diseased, insect infested, non-germinable, or hard seeds.

Inert matter.

(*c*) "Inert matter"—Broken seeds less in size than one-half of a complete seed; or chaff, dust, stones, or any material other than seeds.

Hard seeds.

(*d*) "Hard seeds"—Any seeds whose seed coats are so impervious to water as to delay germination.

Invoice to be given by vendor.

2. (1) Upon the sale of any seeds of the value of not less than one shilling, the vendor shall, at the time of sale, give to the purchaser, or, if the purchaser is not personally present at the time of sale, forthwith send to him an invoice containing the statements required by the Act.

(2) Every such invoice shall specifically state that the seeds passing on such sale are for planting or sowing and the kind or kinds of such seeds, and that such seeds contain no greater proportion or amount of foreign ingredients than is prescribed with respect to that kind or those kinds of seeds, and, notwithstanding any agreement to the contrary, such invoice when received by the purchaser shall be deemed to be a description of the seeds passing on such sale so as to constitute the transaction a contract for the sale of goods by description within the meaning of "*The Sale of Goods Act of* 1896."

Seeds sold in pictorial packets, or other made up parcels.

3. All seeds sold in made-up parcels shall be clearly and indelibly marked upon the outside of each parcel with the year in which such seeds were grown.

The maximum amount of foreign ingredients allowed.

4. The proportion or amount of foreign ingredients which may be contained in any quantity of any kind of seed shall not exceed the proportion or amount respectively set forth in Schedules A, B, and C.

Fee for copy of certificate.

5. The fee for a copy of the result of any examination of any seeds shall be two shillings and sixpence for each sample.

Weight of samples.

6. The weights of seeds to be taken as samples for purposes of examination shall not be less than as mentioned and set forth in Schedule D.

Efficient seed-cleaning machinery.

7. The Regulations shall not apply to—

(*a*) Seeds sold by the actual grower direct to any vendor in possession of one or more efficient cleaning machines, for the purpose of the seeds being cleaned and graded before being offered for sale as seed for sowing.

(*b*) Seeds held in storage by a vendor in possession of one or more efficient cleaning machines, for the purpose of being cleaned and graded and which has not been offered, exposed, or held in possession for sale.

Calculation of percentages.

8. For the purposes of the Schedules to these Regulations, percentages shall, in respect of germinable seeds, dead and non-germinable seeds, and hard seeds, be calculated by number, and in respect of all other matters, by weight.

Marking of samples and fee for analysis.

9. Samples of seeds for sowing sent for analysis by any person other than an officer shall not be of less weight than is prescribed by Schedule D, and in the case of seeds containing foreign ingredients double the weight mentioned shall be sent. All such samples shall be plainly written on in ink giving the following particulars:—

(1) Kind of seed.

(2) Quantity the sample represents.

(3) Marks on bags or grower's name.

(4) Name and address of sender.

Such samples, with covering letter enclosing the prescribed fee of 2s. 6d. for each sample, shall be addressed to the Under Secretary, Department of Agriculture, Brisbane.

Penalties.

10. Any person guilty of any contravention of these Regulations shall be liable to a penalty not exceeding ten pounds.

SCHEDULE A.

FOREIGN INGREDIENTS.

Kind of Seed.	Inert Matter.	Seeds of weeds or seeds of any cultivated plant not included in Schedule A which will not pass through a metal sieve perforated with round holes 2 mm. in diameter.	Seeds of weeds which will pass through a metal sieve perforated with round holes 2 mm. in diameter.	Seeds of any cultivated plant included under Schedule A other than seeds of the kind to which the sample purports to belong.	Seeds of *Cuscuta spp.* (Dodder), *Datura spp.* (Thorn apple), *Ricinus communis* (Castor oil plant), and diseased or insect-infested seeds.	Dead and non-germinable seeds.
	Per cent.	Per cent.		Per cent.		Per cent.
Barley (*Hordeum spp.*)	2	1	Nil	2	Nil	15
Oats cultivated (*Avena spp.*)	2	1	Nil	2	Nil	20
Rye (*Secale cereale*)	2	1	Nil	2	Nil	20
Wheat (*Triticum spp.*)	2	1	Nil	2	Nil	15

Prescribed standards.

SCHEDULE B.

FOREIGN INGREDIENTS.

Kind of Seed.	Inert Matter.	Seeds of weeds or seeds of any kind other than that to which the sample purports to belong.	Seeds of *Cuscuta spp.* (Dodder), *Datura spp.* (Thorn apple), *Ricinus communis* (Castor oil plant), and diseased or insect-infested seeds.	Dead, non-germinable, and hard seeds.
	Per cent.	Per cent.		Per cent.
Cowpeas (*Vigna spp.*)	2	1	Nil	35
Lucerne (*Medicago sativa*)	2	1	Nil	35
Mauritius Bean (*Stizolobium aterrimum*)	2	1	Nil	40

Prescribed standards.

SCHEDULE C.

FOREIGN INGREDIENTS.

Prescribed standards for :—

Kind of Seed	Inert Matter.	Seeds of weeds or seeds of any kind other than that to which the sample purports to belong.	Seeds of *Cuscuta spp.* (Dodder), *Datura spp.* (Thorn apple), *Ricinus communis* (Castor oil plant), and diseased or insect-infested seeds.	Dead and non-germinable seeds.
	Per cent.	Per cent.		Per cent
Beans—				
Broad (*Vicia faba*)	2	1	Nil	25
French (*Phaseolus vulgaris*)	2	1	Nil	25
Lima (*Phaseolus lunatus*)	2	1	Nil	25
Runner (*Phaseolus multiflorus*)	2	1	Nil	25
Beet (*Beta sp.*)	2	1	Nil	45*
Cabbage (*Brassica oleracea capitata*)	2	1	Nil	35
Carrot (*Daucus carota*)	2	1	Nil	45
Cauliflower (*Brassica oleracea cauliflora*)	2	1	Nil	40
Cotton (*Gossypium hirsutum*)	2	1	Nil	30
Cucumber (*Cucumis sativus*)	2	1	Nil	35
Grasses —				
Canary (*Phalaris canariensis*)	2	1	Nil	30
Cocksfoot (*Dactylis glomerata*)	3	1	Nil	50
Couch grass (*Cynodon dactylon*)	2	1	Nil	70
Paspalum (*Paspalum dilatatum*)	4	1	Nil	80
Prairie grass (*Bromus unioloides*)	5	1	Nil	50
Rhodes grass (*Chloris gayana*)	6	1	Nil	70
Rye grasses (*Lolium spp.*)	2	1	Nil	40
Leek (*Allium porrum*)	2	1	Nil	50
Lettuce (*Lactuca sativa*)	2	1	Nil	35
Linseed (*Linum usitatissimum*)	2	1	Nil	25
Maize—				
Dent (*Zea Mays indentata*)	2	1	Nil	15
Flint (*Zea Mays indurata*)	2	1	Nil	15
Mangel (*Beta sp.*)	2	1	Nil	45*
Marrow (*Cucurbita pepo*)	2	1	Nil	35
Melon (*Cucumis melo*)	2	1	Nil	35
Millets—				
Foxtail—				
Hungarian, Liberty (*Setaria italica*)	2	1	Nil	30
Manchurian (*Setaria italica* var. *Manchuria*)	2	1	Nil	30
Siberian (*Setaria italica* var. *rubra*)	2	1	Nil	30
Barnyard—				
Japanese Millet (*Panicum crus-galli* var. *Sativum*)	2	1	Nil	30
White Panicum (*Panicum frumentaceum*)	2	1	Nil	30
Marestail—				
Red French, White French (*Panicum miliaceum*)	2	1	Nil	30
Cat-tail—				
Pearl (*Pennisetum glaucum*)	2	1	Nil	30
Mustard (*Brassica alba*)	2	1	Nil	30
Onion (*Allium cepa*)	2	1	Nil	40
Parsnip (*Pastinaca sativa*)	2	1	Nil	75
Peas (*Pisum spp.*)	2	1	Nil	25
Pumpkin (*Cucurbita spp.*)	2	1	Nil	35
Radish (*Raphanus sativus*)	2	1	Nil	35
Rape (*Brassica napus*)	2	1	Nil	30
Rice (*Oryza sativa*)	2	1	Nil	20
Sorghum (*Sorghum vulgare*)	2	1	Nil	30
Sudan grass (*Sorghum Sudanense*)	2	1	Nil	30
Swede (*Brassica Rutabaga*)	2	1	Nil	35
Sweet corn (*Zea saccharata*)	2	1	Nil	25
Tares (*Vicia sativa*)	2	1	Nil	25
Tobacco (*Nicotiana tabacum*)	2	1	Nil	45
Tomato (*Lycopersicum esculentum*)	2	1	Nil	35
Turnip (*Brassica Rapa*)	2	1	Nil	35
Watermelon (*Citrullus vulgaris*)	2	1	Nil	40
Agricultural and Vegetable seeds not elsewhere included	2	1	Nil	50

* Non-germinable clusters.

SCHEDULE D.

Kind of Seed.	Prescribed Weight.	
Barley, Beans, Cowpeas, Maize, Oats, Peas, Rice, Rye, Tares, Wheat	8 oz.	Prescribed weight of samples.
Canary, Cotton, French Millet, Japanese Millet, Linseed, Lucerne, Prairie Grass, *Sataria italica* (Foxtail Millet), *Sorghum Sudanense* (Sudan Grass), Sorghum, White Panicum	4 oz.	
Couch, Paspalum, Rhodes, and other grasses	2 oz.	
Beet, Cabbage, Carrot, Onion, Parsnip, Radish, Tomato, Turnip, and Vegetable seeds of like size	½-oz.	
Vegetable seeds in made-up packets	3 packets	
Agricultural and Vegetable seeds other than those included above.	2 oz.	

From the Regulations it will be noted that samples of seed may be sent to the Department of Agriculture for analysis. When sending such samples it is of the utmost importance that they be drawn by the sender from seeds in his actual possession, care being taken to make them truly representative of the bulk. The weight of each sample and marking required are fully explained in the Regulations. In case of any complaint regarding purity or germination, the name of the vendor and copy of the invoice received by the buyer should be sent to the Department of Agriculture in the covering letter advising of the despatch of the sample. No charge will be made to farmers sending in samples of seeds that they have purchased for their own sowing, provided the necessary particulars are plainly written thereon, and the vendor's invoice forwarded with the sample. In all other cases a charge of 2s. 6d. is made for each certificate of analysis.

FORM OF CERTIFICATE.

A certificate of analysis gives the following particulars:—

Calculated by Weight.		Calculated by Number.	
Purity (Analytical)	per cent.	Germination	per cent.
FOREIGN INGREDIENTS.			
Inert matter	per cent.	Hard seeds	per cent.
Seeds of weeds or seeds of any kind* other than that to which the sample purports to belong	per cent.	Dead and non-germinable seeds	per cent.

*The principal seeds are (the names of the weed seeds which the sample contains and, in certain cases, the approximate number in one pound).

Unless the sender is careful to forward a truly representative sample the certificate is valueless. Under no circumstances is it a guarantee by the Department of Agriculture as to the bulk, but an analysis of the sample received, giving a plain statement of its condition at the time when such analysis was made.

"Purity" means analytical purity, which is the percentage by weight of pure seeds that the sample contains, and the term "Pure seeds" means the seeds of which the sample purports to consist after the impurities or foreign ingredients, as defined in the Regulations, have been eliminated; but, in the case of those species, kinds, or strains of plants, the seeds of which cannot be distinguished from one another by expert examination, the use of the term "purity" does not imply that the seed is genuine or true to name.

"Germination" means the percentage, calculated by number, of pure seeds as defined above which germinate during a germination test.

"Foreign ingredients" are defined in the Regulations, which, it is well to note, do not prescribe the minimum percentage of germination, but the maximum percentage of foreign ingredients. The minimum percentage of germination can be ascertained by deducting the prescribed amount of dead, non-germinable, and hard seeds from 100. Example: The amount of dead, non-germinable, and hard seeds prescribed for Mauritius beans is 40 per cent.; therefore, the minimum percentage of germination is 60 per cent.

Every purchaser should know the purity and germination of the seed that he intends to buy or sow; also its freedom from diseased or insect-infested seeds. These matters can only be decided by a thorough examination of a large and truly representative sample drawn from the actual bulk in the sender's possession. Seeds constitute the most variable material that the farmer or merchant purchases, and the success or failure of a crop, or even succeeding crops, may be wholly determined by the kind or condition of the seed sown. No one can afford to leave any doubtful point to chance, and it is but common prudence to ascertain the purity and germination of all seeds purchased before sowing or offering them for resale.

Although buyers and sellers are able to form a good idea of the market value or price, experience shows that they are frequently misled as regards purity and germination. It is impossible to determine the amount of weed seeds, non-germinable seeds, hard seeds, or inert matter other than by a purity analysis and germination test conducted under uniform scientific methods. Any opinion as to the quality or condition of any agricultural seeds is useless unless based on the examination of a truly representative sample.

In buying, let quality, not price, be your guide; the best is never too good. When placing an order make it clear that you want seeds for sowing; not only obtain but keep the vendor's invoice. Examine all goods on the day of delivery; when in doubt write at once to the Department of Agriculture.

Before sending any samples, care should be taken to see that the required particulars are plainly written thereon in ink.

COVERING LETTER.—All samples, with covering letter, should be addressed to—

The Under Secretary,
Department of Agriculture and Stock,
Brisbane.

SALT POISONING IN PIGS.

By E. J. SHELTON, H.D.A., Instructor in Pig-raising.

Information was received by the writer recently of a serious loss amongst pigs in Tasmania, as a result of salt poisoning.

It appears that some time ago a steamer bound from Tasmania to the Eastern States of the mainland was partially wrecked on the cost of Tasmania close to one of the larger shipping ports. The steamer's cargo included a large quantity of barley suitable for "feed" for stock. This portion of the cargo was under water for some time before it was possible to release it, but eventually much of it was salvaged. In due course the barley was sun-dried, rebagged, and offered for sale at a very low price, which attracted pig farmers and others. Apparently nothing was said at time of sale as to the origin of the barley, and so it was utilised as a pig food by our informant. Taking a quantity home he utilised it for the purpose of "topping up" some fine stud Berkshires, which it was intended should be exhibited at a large southern show. Some bacon pigs were also fed on this grain, and to the intense surprise of the pig-breeder the pigs began to die off rapidly, exhibiting all the symptoms of poisoning. At this stage it was not suspected that the barley was at fault, nor was this found to be the case except by accidental means. The case was proved and immediately after other foods were substituted the trouble ceased. As this is an important instance of brine poisoning the information is passed on for the benefit of breeders generally.

Very cheap foods are frequently very expensive ones, and the utmost care should be observed in feeding them to stock.

Foods of this description should be fed very sparingly for a few days until their effect upon the animals is noted, and if any signs of illness become apparent the feed should be rejected immediately. Pigs require a certain very small percentage of salt in their food, but in instances like the one referred to it may be regarded as a very serious poison. Numerous instances have occurred of poisoning in pigs that have been fed on swill from restaurants into which hot water has been thrown that had been used for cooking corned beef and ham and other heavily salted provisions.

Soda water or soap powders in the water is also a very prolific cause of intestinal and gastric trouble in pigs.

FRUIT-FLY AND COLD STORAGE.

The following passages are taken from a recent report made to the Secretary for Agriculture (South Africa) by the Chief of the Division of Entomology, and published in the Journal of the Department of Agriculture, Union of South Africa, for October, 1923.

"In several seasons twelve and more years ago experimental exposures of fruit-fly infested peaches to cold storage at Capetown were made to get assurance, other than the commercial experience in shipping, that there was little or no danger of the insect reaching England alive. The results were reassuring, nearly all the larvæ being found dead in two weeks, and all at examinations at the end of the third week. Years later, in 1916, Back and Pemberton, of the U.S.A. Bureau of Entomology, published reports on similar, but more extensive and more carefully conducted, experiments at Hawaii. They arrived at the conclusion—as the outcome of many tests involving thousands of eggs, larvæ, and pupæ—that no stage of the insect could survive refrigeration for three weeks at 33 deg. to 40 deg. F., or for two weeks at 32 deg. to 33 deg. F.

"However, we have the indisputable fact that Fryer, in England, found five living larvæ in Cape peaches this year and reared two adult fruit-flies (*Ceratitis capitata*) from them. The correspondence implies that the minimum temperature of the particular ship's chamber in which the fruit was conveyed was 37 deg., and that the maximum temperature varied widely. The survival of these particular larvæ might therefore be put down to insufficient refrigeration. But some weeks earlier, living larvæ had been found in Salway peaches, packed as for export, after they had been held in cold storage at Capetown for two, three, and four weeks. Senior Entomologist Mally made the later examinations, and reported on 15th April that at the final one he had found thirty-two living maggots out of a total of seventy-one in eighteen infested fruits. In all but two of the fruits the maggots were all dead or all alive, and Mally then got the idea that survival might be associated with extra high protection afforded to particular fruits by packing material. The fruits were very heavily bedded in woodwool, 8 oz. of which were taken from a single tray. The trays each held twenty-four fruits and measured about 18 x 12 x 4 inches outside. All the fruits were equally protected by paper-wrapping, but the woodwool may be supposed to have given more protection to some than to others, and some fruits may be supposed to have chilled slower than other fruits by virtue of their position.

"Efforts to get newly plucked fruit for further experiments were in vain, but Mally continued observations on seventeen further trays of the same lot of peaches. About 7½ per cent. of the fruits were found infested as the examinations proceeded. An examination after five weeks disclosed seventeen living and fourteen dead larvæ from twelve infested fruits, and an examination after six weeks disclosed thirty-three living and sixteen dead from sixteen fruits. Moreover, seven pupæ were found at each of these two examinations, and there were indications that larvæ had emerged from four fruits and escaped. The larvæ found in any one fruit in these examinations were either all dead or all alive.

"The total number of larvæ taken from the fruits that had been refrigerated four weeks or longer was eighty-two. From them were reared twenty-eight male and twenty-nine female flies. Only one fly was reared from the fourteen puparia found in the fifth and sixth weeks. The last emergence was on 10th June, and it may safely be accepted that the remaining insects—that is, twenty-five taken out of cold storage as larvæ and thirteen taken out as puparia—are all dead.

"The temperature records of the chamber for the entire six weeks were studied by Mally. A reading is noted every two hours with apparently inconsequential exceptions. The range is from 25 to 44 deg. The mean of the readings is 33.972 deg., over half of the readings are 33 deg., and on only three days is 33 deg. not recorded. On those three days the range is 34 deg. to 39 deg.

"Hence, notwithstanding the apparently reliable findings of Back and Pemberton, Mally is accepted as having demonstrated that *C. capitata* larvæ may survive in cold storage at about 34 deg. for considerably longer than three weeks. The survival for six weeks was in even larger proportion than the survival for four weeks.

"Mally has advanced the plausible hypothesis that the larvæ that die in refrigeration such as that now concerned, are killed rather by abrupt transition from a high to a low temperature than by being kept at a low temperature. If his reasoning is correct, the complete kill in the earlier experiments at Capetown and Hawaii may be explainable on the ground that all the maggots experienced a sudden chilling. It is recalled that in the major experiments made at Capetown years ago the infested fruits were exposed in single-layer boxes without paper

wrapping and with little woodwool. In the recent experiments, as already stated, the fruits were in papers and bedded in a bulky packing of woodwool. It follows there is still a hope that refrigeration may be made thoroughly effective, and also that it is effective ordinarily.''

This demonstration that fruit-fly larvæ may live in cold storage at about 34 deg. for six weeks, and then successfully transform to flies, greatly emphasises the need for the packers of export fruit, most particularly of peaches and nectarines, to select fruit for export with extreme care to avoid the inclusion of any that have become infested by the pest. The packing of a variety from an orchard should cease at once if maggots are found to have appeared in it. Growers whose experience has taught them to expect the insect are urged to use poison bait to the very best of their ability to kill the parent flies before eggs are laid. It seems not to be generally known how extraordinarily successful in preventing attack baiting has proved with leading peach exporters of the western Cape Province. The Government inspection at the ports hereafter may be expected to be more severe than ever before; but growers will largely have only themselves to blame if their consignments are rejected for export owing to fruit-fly.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF OCTOBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING OCTOBER, 1923 AND 1922, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Oct.	No. of Years' Records.	Oct., 1923.	Oct., 1922.		Oct.	No. of Years' Records.	Oct., 1923.	Oct., 1922.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	0·98	22	0·47	0·87					
Cairns	2·00	41	...	1·33	Nambour	3·05	27	1·13	0·49
Cardwell	2·08	51	...	1·69	Nanango	2·29	41	1·39	1·40
Cooktown	1·13	47	0·01	0·10	Rockhampton ...	1·87	52	0·11	2·47
Herberton	0·96	36	0·18	0·58	Woodford	2·59	36	0·91	2·00
Ingham	1·69	31	0·02	3·30					
Innisfail	3·04	42	...	2·90					
Mossman	3·00	15	...	1·96	*Darling Downs.*				
Townsville	1·29	52	...	1·89					
					Dalby	2·09	53	0·73	1·35
Central Coast.					Emu Vale	2·28	27	0·46	1·11
					Jimbour	1·85	35	1·64	1·74
Ayr	1·02	36	0·02	0·95	Miles	1·98	38	0·97	1·64
Bowen	1·06	52	...	0·18	Stanthorpe ...	2·61	50	1·14	1·55
Charters Towers ...	0·71	41	0·01	0·05	Toowoomba ...	2·64	51	1·98	1·50
Mackay	1·87	52	0·10	1·76	Warwick	2 35	58	1·71	1·59
Proserpine	1·80	20	...	0·97					
St. Lawrence ...	1·84	52	...	0·23					
					Maranoa.				
South Coast.									
					Roma	1·78	49	0·80	3·40
Biggenden	2·25	24	0·51	1·22					
Bundaberg	2·10	40	0·34	0·80	*State Farms, &c.*				
Brisbane	2·59	72	0·45	2·10					
Childers	2·40	28	0·71	0·33	Bungeworgorai ...	1·41	9	0·71	2·27
Crohamhurst ...	3·61	30	0·93	1·40	Gatton College ...	2·22	24	0·21	1·66
Esk	2·50	36	1·00	4·78	Gindie	1·42	24	0·65	2·15
Gayndah	2·38	52	1·63	0·73	Hermitage ...	1·97	17	1·36	1·59
Gympie	2·72	53	0·76	0·50	Kairi	1·28	9	0·36	1·41
Glasshouse Mts. ...	2·79	15	0·16	1·80	Sugar Experiment				
Kilkivan	2·61	44	0·79	0·18	Station, Mackay	1·70	26	...	1·45
Maryborough ...	2·69	52	0·92	0·29	Warren	2·39	9	...	0·75

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for October this year, and for the same period of 1922, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, Government Meteorologist..

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

Milking Records for October, 1923.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			Lb.	%	Lb.	
Hedges Madge ..	Friesian	18 Aug., 1923	780	3·4	30·90	
Magnet's Leda ..	Jersey ..	18 Aug., 1923	574	4·6	30·90	
College Cobalt ..	,,	14 Sept., 1923	690	3·7	29·70	
College Grandeur	,,	11 July, 1923	450	5·5	29·10	
Prim	Friesian	4 April, 1923	810	3·1	29·10	
Miss Security ..	Ayrshire	8 June, 1923	630	3·9	28·80	
Bellona	,, ..	3 Aug., 1923	570	4·1	27·30	
College Wildflower	Jersey ..	13 Aug., 1923	540	4·3	27·00	
College Cold Iron	,,	23 April, 1923	420	5·1	25·20	
College Evening Glow	,,	5 April, 1923	390	5·2	23·70	
Lady May ..	Ayrshire	14 July, 1923	510	4·0	23·70	
College Prima Donna	Friesian	19 Mar., 1923	510	3·7	23·10	
Comedienne ..	Jersey ..	10 July, 1923	420	4·7	23·10	
Buttercup ..	Shorthorn	7 Sept., 1923	720	2·6	22·50	
Confidante ..	Ayrshire	7 Sept., 1923	540	3·6	22·50	
College Desire ..	Jersey ..	11 July, 1923	420	4·4	21·60	
Lute	Ayrshire	26 April, 1923	450	4·0	21·00	
Snowflake ..	Shorthorn	17 May, 1923	480	3·7	20·80	
Lady Loch II. ..	Ayrshire	26 April, 1923	420	3·7	20·70	
College Promise	Jersey ..	14 Aug., 1923	450	3·9	20·40	
Songstress ..	Ayrshire	22 Aug., 1923	450	3·8	20·10	

EAT MORE FRUIT—COMMONWEALTH CAMPAIGN.

The Commonwealth Government Fruit Pool is commencing an "Eat More Fruit" Campaign throughout the various States, with the object of encouraging the public to eat more canned fruits, and to dispose of the 1922-3 canned fruit-crop. The pool has acquired the whole of the crop, which comprises peaches (both clingstone and freestone), apricots and pears, and is specially reducing the price to the consumer in order to encourage sales. Choice fruit picked ripe in the orchards can grace the table now, when fresh fruit is scarce, enabling the housewife to give the family the delicious contribution that fruit makes towards better health. Health authorities, dieticians, and mothers, all recognise the necessity for the liberal use of fruits in the daily diet. The value of fruit as a balancing element and natural regulator is universally acknowledged. The pool urges that canned fruit be served in every household in some form every day. Just because fresh fruits are scarce, and very expensive now, is no reason for omitting them from their important place in the daily menu. From a patriotic standpoint the "Eat More Fruit" Campaign should be encouraged. The Commonwealth Government has come to the aid of the industry, and by taking over the whole pack of canned fruits has helped the fruitgrowers, many of them soldier settlers, to tide over their present difficulties. If three cans of fruit are eaten by each Australian in the course of the next few months, and then, afterwards, regularly each year, the domestic market will consume all Australia can produce. Calculation has shown that the Australian consumption of canned fruit is 2 lb. per head per annum—one tin of fruit each—against 7 lb. per head in America. Australians eat 100 lb. of fresh fruit to the American's 400 lb. From a health point of view, the Australian would be immensely benefited if his consumption of fruit approached that of the American, particularly as he is a record consumer of meat and tea. The Commonwealth Fruit Pool has issued to all grocers in Queensland a specially prepared booklet containing a carefully compiled set of recipes, printed on gummed paper, ready for attachment to the housewife's cookery book. If any difficulty is experienced in obtaining these, a set will be forwarded to anyone on application to the Collector of Customs, Brisbane.

SUGAR: FIELD REPORTS.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report (23rd November, 1923) from the Northern Field Assistant, Mr. E. H. Osborn:—

Herbert River.

Early in October the dry conditions experienced farther South were also in force here, but not to the same extent. Up to then, the Ingham rainfall had amounted to 31.86 in., or more than 50 per cent. short for the period under review. Creeks and rivers were very low, and pasturage had also fared badly.

Despite an abnormally dry time, it was most gratifying to learn that the company expected an increase of about 10 per cent. on its preliminary tonnage estimates for the season. This speaks well for the fertility of the Herbert River lands under dry conditions. Also, to judge by the very large quantities of sugar being sent away from each mill, the sugar content must be high.

Some good plant and ratoon cane was seen in various places; although backward in growth, most of it was fairly green looking, and well cultivated, and only wanted good weather conditions to make sure of a heavy crop for 1924.

Diseases.—Just now the district is suffering rather badly from gum. This is very prevalent in H.Q. 426 (Clarke's Seedling), although Badila and H.Q. 409 have also been affected to a slight extent. In the Macknade area cane, particularly H.Q. 426, has been badly affected. Nearly all classes of cane are suffering. In a plant Badila paddock where misses were supplied with H.Q. 426, these latter, although cutting well, were very gummy.

The company always condemned such practices as likely to affect the surrounding Badila. Another factor which probably helped the disease to spread was the planting of the whole stick of cane in the drills, afterwards chopping same into sets with cane knives. This practice is carried out more on the Herbert than in any other district.

Probably the dry weather has helped the disease to show up more markedly this year, but the fact remains that it is essential for every grower to help the company to rid the district of such a disease.

Another disease observed was leaf scald. This was found in H.Q. 426, Badila, Korpi, B. 208, M.Q. 1, M.Q. 2, and M.Q. 5; the three Mossman seedlings being introduced from Mossman by the company in, I think, 1921, but only grown in their nursery. Just at this period of the year it is somewhat hard to definitely diagnose leaf scald, but any suspicious looking stools should be destroyed and burnt off.

Grubs and Borers.—The former caused less damage than in late years, and the latter are not quite as bad as in previous years. At Macknade the company have now three breeding cages for Tachinid flies, and are liberating them in small blocks of standover cane left for the purpose.

Cane Varieties.—N.G. 15 (Badila), H.Q. 426, H.Q. 409, Korpi, Nanemo, and Orambo are the principal canes grown upon the Herbert. H.Q. 409 has cut very well indeed this season and has proved a rather quicker striker than in past years. One block planted last August (1923) after only two ploughings had an excellent strike. With this cane it appears that it wants either a very early or a late planting, and with only a light covering of soil. Korpi, Nanemo, and Orambo are also very good canes of good sugar content and fair tonnage.

Of canes from the Experiment Station E.K. 28 and Q. 813 are so far easily the best, and should give good tonnage and density returns in poor to medium soils. Those growers who have had experience of Q. 813 are so far very pleased with it.

Mr. A. Blackburn had just finished harvesting a block of first ratoons consisting of Q. 813, H.Q. 409, and Badila. As a plant crop the Q. 813 easily beat the other two canes for tonnage, and has again done so in the ratoons. Early in the year Mr. Blackburn planted some 13 acres of Q. 813, besides a large acreage of other varieties.

The Q. 813 was the only cane that never missed, and at time of my recent visit looked very well, comparing very favourably with cane seen elsewhere. Quite a number of other growers are now trying plots of this cane.

Innisfail District—Goondi.

Earlier estimates had been increased, and the mill was doing some splendid work—one week's crushing representing 6,013 tons of cane, probably an Australian record for one week. Nearly all the cane grown upon Goondi is Badila. Mr. C. McGowan, of Daradgee, harvested early in the season a 12-acre block off medium soil. It consisted of 3 acres each of E.K. 1, E.K. 28, and H.Q. 458, and another

3 acres of mixed canes. This block had about 2 cwt. of manure per acre applied, and cut at the rate of 42 tons per acre, although previously 26 tons to the acre was its highest yield. The cane was cut early under very cold conditions, consequently the ratoons are light.

Mourilyan.

This mill, although starting late, anticipates a very heavy tonnage. Up to time of visit the density has been very high; for that week the average was 15.8, worth £2 14s. 6d. per ton, taking some 6½ tons cane to 1 ton of sugar.

As in other parts of the Innisfail area, the cane looked remarkably well, although of course wanting rain badly. Most of the farms visited were very well cultivated, and a large quantity of manuring had been carried out. Mr. J. McCutcheon, of Liverpool Creek, recently cut a crop of fourth ratoon Badila returning 36 tons per acre. It had been manured with 8 cwt. of manure per acre, and had been deeply skeleton ploughed between the rows four times. As a third ratoon crop he manured one-half of the block only, and the returns were 25 tons per acre for the whole block. Fifth ratoons also looked very well. Mr. McCutcheon is a believer in ploughing in beans and also in skeleton ploughing, and his results certainly justify his faith. Near by his farm a 20-acre block of August plant Badila, belonging to Mr. F. R. Gill, looked healthy and green.

Nearer Mourilyan, Mr. M. Schilling was very pleased with a block of Q. 813. This only had two ploughings, in old and medium ground, and was cut at eleven months old, yielding 25 tons per acre, and giving an average c.c.s. of well over 15. His average for one day's delivery was 15.65 c.c.s., when the mill's average in Badila was 14.5. Quite a number of Mourilyan farmers have obtained plants from Mr. Schilling.

Diseases.—Leaf scald symptoms were seen in various scattered places, but, so far, in nearly all cases only single shoots seemed affected. Mosaic was also noticed in several places in H. 109.

Grubs and Borers.—Very little damage has been caused by the former in either of the areas under review, and the latter, although quite bad enough in a few places, do not seem to be as evident as in former years.

At Goondi it is understood the company proposes to breed Tachinid flies for liberation.

CHARCOAL FOR PIGS—AN AID TO DIGESTION.

At this season of the year, when there is generally a Spring or a Christmas-New Year cleaning (so called) of the barns and corn cribs in preparation for the New Year and Autumn crops of corn, many pig pens and paddocks and the barns generally will be found littered with corn cores and old husks and cobs. If left lying about these will rot and form a breeding ground for disease germs of every description, besides giving the place an untidy and an insanitary appearance. Charcoal is one of the best agents that we possess for absorbing gases and acids formed in the process of digestion. In thus assisting in the digestive process it plays a most important part, as if the food passes freely through the intestines and absorption of the digestible nutrients proceeds rapidly, the growth and development of disease-producing germs are checked.

The careful farmer, therefore, should see to it that all these corn cores, husks, &c., are raked up on a bright, breezy day and are burnt until they are in a charred condition, when clean water should be sprayed over the pile to stop the burning, or the pile may be covered with clean earth, wood ashes, or wet bags. Some farmers sprinkle the pile with coarse salt before applying the water, and this is an advantage if a light sprinkling of salt only is made.

Old and young pigs will visit the heaps whenever they have the chance, and will not let it alone until every particle of charred cobs has disappeared. Pigs two or three weeks old will be found picking out small pieces, whilst older pigs will go off with a mouthful of the larger pieces. Let the pigs eat the burnt cobs instead of trampling them over or allowing them to rot on the ground, and the results will be found to be entirely satisfactory.

Clean up your pig pen and yards and give the pigs a chance to sleep in dustless, cobless pens or houses. Do not forget that cleanliness is next to godliness in the piggery as well as in other places.

The pig truly is a wonderful scavenger. He has been described as the housewife's most wholesome sink.—E. J. Shelton, H.D.A.

CANE PEST COMBAT AND CONTROL.

Mr. Edmund Jarvis, Entomologist in Charge, Bureau of Sugar Experiment Stations, has forwarded the following report to the Director (Mr. H. T. Easterby):—

Parasites of Cane-borer Beetle.

The activity of this important branch of control work is being continued, and at the present time Tachinid parasites of the weevil-borer are freely emerging at our laboratory.

Since reporting last month additional liberations of this useful parasite have been effected in the South Johnstone area, where the borer pest appears just now to merit special attention.

On 18th October two boxes containing fly-infested cane-sticks taken from a breeding case were established on selections situated near No. 2 Branch of the main tramline.

This work was carried out by one of my assistants, Mr G. Bates, who at present is being trained here in this particular line of control, which includes the breeding, handling, transportal, and liberation of the well-known Tachinid fly (*Ceromasia sphenophori*).

Boxes of parasites set up in the field among borer-infested cane are made to hold from six to eight sticks, 2 ft. 6 in. long, containing pupæ of the parasite from which flies are just about to emerge. Each of these canes harbour from 10 to 20 fly pupæ, so that about 100 flies may be expected to issue from a box containing eight sticks. The four legs supporting one of these boxes are stood in tins of water to prevent invasion from ants, and the parasites simply escape through a few narrow slits left for that purpose when nailing on the cover. After emerging naturally in this manner they fly off the box, and finding themselves in the immediate vicinity of their host, are able to at once commence the useful work of parasitising the borer grubs.

On 31st October Mr. Bates established three additional cages in the Silkwood and Japoon areas; and also liberated 73 specimens of the Tachinid fly, which were transported alive in glass tubes and let go on three different selections in the mill area, and at No. 1 Branch.

These parasites will be emerging daily at the laboratory during the next couple of months, and canegrowers desiring to obtain specimens are asked to apply to the Entomologist at Meringa.

Parasites will be liberated free of any charge to those who will agree to leave uncut about a quarter of an acre of borer-infested cane for the flies to breed in.

Para-dichlor. as a Deterrent.

Experiments with the above fumigant this season were commenced on 9th November, with the object, in the first place, of testing its possibilities as a deterrent against oviposition.

Beetles will appear on the wing directly the ground becomes moist enough for them to escape from the pupal cells.

After copulation they will resort to feeding-trees, and not start to lay eggs until two or three weeks later.

Para-dichlor. is best applied either before or just after emergence of the beetles. If injected about a week after their appearance the soil would have ample time in which to become impregnated with the odour of this fumigant before invasion of a plantation by egg-laden females.

Ground so treated would possess strong deterrent properties, and beetles could not remain alive in it for more than a few minutes, so that any chancing to enter the soil would be compelled to hastily decamp. As a matter of fact, they would doubtless at once detect the odour on the surface-soil and be effectually repelled.

Thus in normal seasons the work of injecting could, if desired, be commenced in November, while the cane is quite small, as greybacks usually appear about the middle of that month, and the odour of para-dichlor. endures in the soil for a period of about eight weeks.

In the event of such work being delayed until December or January, any late eggs, together with first and second stage grubs, would be destroyed before the cane had been materially damaged.

Experimentation last season demonstrated that ¼ oz. injections of para-dichlor. will effect impregnation of the soil a fortnight after application, continuing repellant during a period of at least ten weeks. Now, we may safely assume, from data already obtained by laboratory and field experiments, that ¼ oz. injections put in about the middle of January would by the end of that month have killed all grubs present in the soil, and thus effected the desired control of this pest.

Such result could, as mentioned last month, probably be obtained by evaporation of only 1/24th of an ounce—viz., one-sixth of the ¼ oz. injection. It follows, therefore, that a similar mortality could be secured from ⅛ or perhaps 1/16th oz. injections, seeing that the odour arising from these doses of para-dichlor. would effect impregnation of the soil during a period of from three to six weeks.

Experiment plots will be planned this season to determine the minimum quantity of the fumigant required per acre for effective treatment of the grubs.

Last season's experiments worked out at from 1¼ to 2½ cwt. per acre, but I hope to be able to reduce this amount to 90 lb. or even less, which would bring the cost of material below that of carbon bisulphide or other fumigant.

The best time to apply para-dichlor. is when the soil is in a moist condition, but at the same time open for such fumigation.

Experiment plots just started at Meringa and Kamma were treated with ⅛ oz. injections, which in the event of beetles emerging before the end of November should prove an effective deterrent against oviposition.

Carbon Bisulphide Kills Cane-beetles in Pupal Cells.

An experiment was carried out on 30th October to determine the effect of fumigation of the soil on beetles of *Lepidoderma albohirtum* lying in cells at depths of from 10 to 18 in. below the surface. The plot selected consisted of a piece of land 3 ft. 4 in. by 2 ft. 6 in., situated on red volcanic highland, ploughed about 5 in. deep, and directly over a line of stools that had been attacked by grubs last season. This was treated with ½ oz. injections of carbon bisulphide, administered on both sides of the row, 15 in. apart, 6 in. from centre of stools, and 8 in. deep.

When examined twenty-one hours after treatment the plot was found to contain six beetles of *albohirtum*, all of which were quite dead.

Three of these were lying at a depth of 10 in., and the remainder at 12, 16, and 18 in. below the surface. The one killed at 18 in. was situated directly under an injection, those at 12 and 16 in. were situated 4 and 6 in. laterally from points of injection, while the three beetles at 10 in. deep were all lying about 6 in. from points of fumigation.

A single stool was then treated on four sides with ¼ oz. doses, and when examined twenty-four hours later three beetles were found under it.

Two of these, located at depths of 10 and 16 in., were dead, and the third, lying 18 in. from the surface, was alive and just under the centre of the stool.

This work of injecting and examination was carried out by Mr. H. Knust. The top soil at the time was very dry and in favourable condition for such fumigation, the ground, however, being moist below a depth of about 9 in. from the surface.

The data obtained indicate that fumes of bisulphide are able to penetrate the walls of the pupal cells of this destructive beetle; and that such fumigation could, if desired, be made use of on infested areas of cane land to destroy these beetles before they are able to emerge from the soil.

Tineid Moth-Borer of Sugar-cane.

The discovery of this seemingly insignificant moth-borer was made by the present writer in November, 1919, when it was bred for the first time from young ratoons collected at Meringa, Kamma, and Pyramid.

A full account, accompanied by illustrations of the life-cycle stages of this pest, was published during 1921 in Bulletin No. 11 of our Division of Entomology. Its free occurrence this season at Banna has enabled us to breed more than 300 specimens of this moth from ratoons collected by Mr. W. C. Dormer towards the end of October.

Specimens of an hymenopterous parasite of this moth have also been obtained, and possibly additional insect enemies may be bred later on.

ABSTRACTS AND REVIEWS.

All foreign agricultural intelligence in this Section, unless otherwise stated, is taken from the *International Review of the Science and Practice of Agriculture*, published at Rome by the International Institute of Agriculture.

The Genetics of Jacob.

R. E. STONE, Department of Botany, Ontario Agricultural College, "Journal of Heredity," August, 1923.

The science of genetics is twenty-one years old, but the foundations upon which genetics rests are very old indeed. The very beginnings are prehistorical, and enough information on heredity was early acquired to give rise to certain systems of selection in animal breeding.

Jacob, for example, was able to mulct his father-in-law through a definite system of selection and mating. That Jacob was in advance of many in his time there is little doubt, and also there is little doubt that he did not care to have his associates learn the secret of his success. He was, throughout his whole life, mainly concerned with the advancement of Jacob and Jacob only. Although we may agree that this son of the chosen people was a consummate rogue, we often do him injustice on the score of knowledge.

In the book of Genesis xxx., 27-42, there is set forth in detail a system which Jacob is supposed to have used in order to influence the colour of his flock. This passage is often cited to show that Jacob believed in the efficacy of maternal impressions. A careful reading of the chapter shows that he realised the importance of segregation, as he put three days journey between his spotted herd and the flocks of Laban. Furthermore, this account has been written by an observer not concerned in the material aspect. We get a clearer understanding of Jacob's notions concerning breeding if we read Genesis xxxi., 8-14, which purports to be Jacob's own account of his procedure:—

> "If he (Laban) said thus. The speckled shall be thy wages; then all the cattle bare speckled; and if he said thus. The ring-straked shall be thy hire; then bare all the cattle ring-straked. Thus God hath taken away the cattle of your father and given them to me, and it came to pass at the time that the cattle conceived, that I lifted up mine eyes, and saw in a dream, and *behold* the *rams which leaped upon* the *cattle were ring-straked*, and *speckled*, and *grizzled*. And the angel of God spoke to me in a dream saying, 'Jacob,' and I answered, 'Here am I.' And he said, 'Lift up now thine eyes and see, all the *rams* which *leap* upon the *cattle* are *ring-straked*, *speckled*, and *grizzled*, for I have seen all that Laban doth unto thee.' "

Jacob had been "stung" in his first contract with Laban. He had laboured fourteen years to make good his slip and all this time had been trying to devise a means whereby to provide for his family. As a result of long brooding while tending his herds his "inspiration" came in a dream:—Mixed breeding and isolation. To how many scientific men has the solution of a difficult problem come in the same way?

Taking the two chapters together it would seem that Jacob had observed the results of cross-breeding, and probably also observed what took place when both parents were of the same type. Of course, we cannot now make a genetic analysis of Laban's cattle, but if "ring-straked, speckled, and grizzled" are assumed to be dominant characters, we must recognise that Jacob's breeding methods were not based altogether on superstition. He realised the value of isolation and had some knowledge of the importance of giving the get an opportunity to develop under the most favourable conditions. Since the modern breeder makes use of the same principles it indicates that the art of breeding was fairly well advanced at that early period.—1746 (?) B.C.

The Power of Pedigree.

"Live Stock Journal" (U.K.).

Pedigree is always a means to an end. Its influence may be good or bad. It is not the fault of the pedigree as a system, but of those who make use of it. It has been by the power of pedigree rightly used that we own the best herds and flocks in the world, but all the same it is equally possible to use pedigree wrongly, and by breeding from bad stock on pedigree lines to perpetuate and increase bad qualities and characteristics. It is to pedigree alone that we can look for a succession of good qualities, for no matter how charming in looks two common-bred parents may be,

mated together no one can tell what the progeny will be. The only safe method to pursue in breeding is upon pedigree lines, and, in cross-breeding, by the use of pedigree sires and dams, either of pure blood or got by pedigree sires. It is the only means whereby we can keep up the standard of our live stock and bring about those improvements and characteristics which are necessary and desirable as time goes on.

Sheep and Lamb-raising—Cross-breeding Experiments.

"Journal of Agriculture," South Australia, October, 1923.

Interesting particulars relating to the sheep and lamb raising experiments conducted at Roseworthy Agricultural College. The lambs sired by the mutton breeds (the shortwools) have matured much more rapidly, showing a greater increase in weight per day than those sired by the longwools, even the slowest maturing, the Southdown, being ahead of any of the half-bred longwool lambs. The half-bred English Leicester lamb has shown the greatest weight and increase per day in its class, whilst the Shropshire is at present ahead of the Dorset Horn. However, during the fortnight between the twelfth and fourteenth week the latter were increasing at the rate of .67 lb. per day, as against 59 lb. for the former. It would appear, therefore, as if the Dorset Horn will later on outrival the Shropshire. The Southdown rams left the highest percentage of lambs, but were little inferior to the Dorset Horns. From the half-bred longwool ewes the highest average weight of fleece was obtained from the Lincoln-merino ewe, followed by the Border Leicester-merino, while the Romney Marsh-merino and the English Leicester-merino were approximately equal.

The report goes on to state that as the tests have been carried out over such a limited period—two seasons—no definite conclusions can be given, but the results so far obtained tend to indicate:—That the Shropshire is the most profitable ram with which to mate the merino ewe, although the progeny of the English Leicester and Dorset Horn are but little inferior; that the Border Leicester-merino is the most profitable of the half-bred longwool merino ewes under test; that when mated with half-bred longwool merino ewes the Dorset Horn ram produces the earliest maturing and most remunerative lamb at local values.

The Freezing Temperatures of Some Fruit, Vegetables, and Cut Flowers.

WRIGHT, R. C., and TAYLOR, G. F. (Office of Horticultural and Pomological Investigations, Bureau of Plant Industry), United States Department of Agriculture, Bulletin No. 1133, pp. 1-8 Washington, D.C. 1923.

Determinations of the freezing points of a number of fruits and vegetables have been made by the Bureau of Plant Industry in compliance with the ever-increasing demands of trade and shipping.

Determinations were made as follows:—Apples: average 28.48 deg. F.; bananas: (green) peel 29.84, pulp 30.22, (ripe) 29.36, pulp peel 20.6, blackberries 29.15, cherries 27.81, cranberries 26.7, currants 30.21, gooseberries 28.91, grapefruit 28.36, grapes 28.16, loganberries 29.51, oranges 28.03, peaches 29.4, pears (hard-ripe) 28.46, (soft-ripe) 27.83, persimmons 28.33, plums 28.53, raspberries 30.41, strawberries 29.93.

Vegetables: Average for beans (snap) 29.74, cabbage 31.18, carrots 29.57, cauliflower 30.08, egg plant 30.41, kohl rabi 30.02, lettuce 31.2, onions (dry) 30.09, peas (green) 30.03, potatoes 28.92, sweet corn 28.95, sweet potatoes 28.44, turnips 30.23.

Cut Flowers: Petals and leaves of lilies, peonies, and roses from 27 to 31.

The Mosquito-Destroying Power of Algæ belonging to the Genus Chara.

Pardo, L. Observaciones acerca de la acción de la *Chara* sobre las larvas de los mosquitos. *Boletin de la Real Sociedad espanola de Historia natural,* Vol. XXIII., No. 3, pp. 154-157. Madrid, 1923.

As a result of his study of Prof. Caballero's work (1919) on the effect of *Chara fœtida* upon the larvæ of the genera *Stegomyia, Culex,* and *Anopheles,* the author was induced to visit the swamp zone of Onteniente (Valencia). Here he found, in close proximity to ponds swarming with mosquito larvæ, a single large pool which, although the water was very rarely renewed, proved entirely free from these pests. The bottom of the pool was thickly covered with *Chara hispida,* a plant that, as Prof. Morote has also discovered, differs from other kinds of *Chara* in being able to thrive at a depth of over 3 m, which is a matter of great importance when it is necessary to destroy larvæ in very deep water. These observations were completed by laboratory experiments. Some specimens of *Chara hispida* were planted

at the bottom of a large glass jar, into which, as soon as the plants had grown strongly (26th July), six *Stegomyia* larvæ were introduced. Three of these insects died after two days, two succumbed on the third day, and the last on the fourth day. Three of the strongest *Stegomyia* larvæ (which were shortly about to pupate) were left in the glass jar which served as a vivarium for the mosquitoes, and some *Chara* plants were introduced. Three days later two of the larvæ died, and the next day the survivor perished. In similar experiments conducted by Prof. Caballero with *Chara fœtida* the larvæ did not die so soon, nor were they all killed. It would therefore appear that the larvicidal action of *C. hispida* is stronger than that of *C. fœtida*.

The author described in conclusion various observations made in the Botanic Gardens of Madrid which confirm the preceding statements. He further draws attention to the fact that the hemp retting-ponds in the neighbourhood of Valencia contain a thick growth of *C. hispida* and are entirely free from mosquito larvæ.

Modern Seed Testing : The New Zealand Official Seed Station.

FOY, N. R. (Biological Laboratory, Wellington.) "The New Zealand Journal of Agriculture, Vol. 26, No. 2, pp. 65-72. Wellington, 1923.

The author mentions the work carried out at the principal seed stations throughout the world, with special reference to the two leading stations at Zurich and Copenhagen. This is followed by a detailed description of the system adopted in New Zealand by the Official Seed Station in collaboration with the Biological Laboratory of the Department of Agriculture. Two recognised methods have been tried, the Continental and the Irish, but up to the present the latter method has been found more economical and practicable.

Germination tests are made in three specially constructed germinators—(1) The all-metal water bath type (enclosed on all sides by a water jacket), used for the testing of more difficult seeds such as rye grass, cocksfoot, dogstail, and fescue; (2) the glass wooden-frame type, for all clovers, cruciferæ, cereals, peas, and vegetables; (3) the small water bath type, for paspalum, Poa species, &c., where a high temperature is required. With the exception of paspalum and Poa species (95 degrees to 65 degrees F.), cereals at ordinary room temperatures, and peas 75 degrees to 60 degrees F., all seeds are germinated at a temperature from 85 degrees to 65 degrees F., subsequently rising to 85 degrees for eight hours, and then the temperature is lowered to 65 degrees for the remaining sixteen hours.

Peas and beans are soaked in water for sixteen hours before placing in the germinator, damp sawdust being used for the beans. Four counts are made of each sample. The intervals allowed vary according to the class of seed under test. The number germinated is entered on the record card.

In the purity analysis the percentage of extraneous seeds is given by weight.

After the second germination count a report is forwarded to the sender of the seeds, stating the average germination after a specified number of days and the percentage of impurities. This facilitates discrimination as to the ultimate value of the species, and the interim report also gives a good indication of the vitality of the type. The final report at the close of the testing period registers the intermediate and final germination, each after a certain fixed number of days, and in the case of purity tests the percentage of extraneous seeds and a complete list of the impurities.

Any peculiarity noted about the sample, such as the presence of mites, &c., is also reported. Allowances are also made for hard seed coats common with clover seeds.

In addition to germination and purity tests, research is being made relative to seed storage, loss of vitality, and improved methods of testing.

Forage Plants for Dairy Cattle in New South Wales.

HAYWOOD, A. H. (Manager, Wollongbar Experiment Farm). "Dairying under North Coast Conditions." The Agricultural Gazette of New South Wales, Vol. XXXIV., Part 1, pp. 41-48. Sydney, 1923.

The information given in this article is based upon experiments made at the Agricultural Station at Wollongbar. The author recommends the following forage plants for dairy cattle, cultivated under conditions of drought such as are met with on the northern coast of New South Wales.

Paspalum repens grows luxuriantly in summer, but towards the end of that season it seeds and quickly loses its nutritive properties. Further, after some years the ground on which this crop has been grown becomes covered with roots that prevent the air having access to the soil and cause the loss of much rain-water.

In order to remedy this difficulty the author recommends that the crop be ploughed in, so that it may rapidly decompose, after which a strong growing plant that will exterminate *P. repens* must be sown. *Sorghum halepense* is very suitable for the purpose. After a second crop has been grown the ground may be again sown with *P. repens*.

In addition to *S. halepense*, which is very well adapted for the first crop, there are other plants that can be used, such as Elephant Grass (*Typha elephantina*), Guinea Grass (*Panicum maximum*), piassava (*Attalea funifera*) and Kikuyu Grass (*Pennisetum clandestinum*), all of which are equally suitable. They make a good change of fodder for stock, which eat them with avidity.

The pastures should be divided into enclosures so that green food can be provided for the animals at almost every season of the year. This subdivision of the ground would also encourage the growth of white clover (*Trifolium repens*), which is apparently the only plant able to live in company with paspalum. When several small enclosures are available the cattle can be turned into one to keep down the paspalum, which may be cut in another by means of a reaper and removed, thus giving the white clover a better chance to grow. *Paspalum repens* can be made into silage, but it has little nutritive value and must be fed with concentrates. It makes an excellent litter. Among the various grasses that can be used the author recommends *Dactylis glomerata* (Cocksfoot grass), *Bromus ciliatus*, and *Agropyrum repens* (couch grass). These grasses supply a large amount of nutritious, appetising food during the two or three years before *Paspalum repens* has taken possession of the ground. They also make excellent winter fodder.

Rhodes Grass (*Chloris Gayana*) is another very useful plant; but it must be prevented from growing too rank, otherwise it becomes tough and unpalatable to the cattle. This applies also to Guinea Grass (*Panicum maximum*), which makes excellent fodder and yields sometimes as much as 40 tons per acre. The native blue couch grass (*Agropyrum*) has always been valued as a stock feed and also on account of its resistance to long periods of drought.

Para Grass (*Panicum molle*) makes good hay and stands trampling and frequent grazing. Other grasses also mentioned by the author in this connection are: Kikuyu Grass (*Pennisetum clandestinum*), which must be kept closely grazed, and Elephant Grass (*Typha elephantina*).

For a farm of 100 acres the author suggests the following fodder plants being sown on an area of 20 acres:—

Maize, 5 acres; *sorghum halepense*, 5 acres; cow cane (*Saccharum officinarum*), 5 acres; wheat, 3 acres; sweet potatoes, 2 acres. Total, 20 acres.

The Cinematograph in the Country Districts of France.

From the funds set apart by the law of 5th August, 1920, for the purpose of agricultural instruction, the French Ministry of Agriculture is able to make grants for the construction or purchase of films of agricultural interest, or for the installation and working, in the rural communes or institutes for agricultural instruction coming under the law of 2nd August, 1918, of cinematograph apparatus, whether fixed or movable, intended for the popularisation of knowledge useful to agriculture, or for agricultural propaganda. (''La Vie Agricole et Rurale,'' 14th April, 1923.)

Teaching by Means of the Cinematograph in France.

At the present time it is possible for the sum of 1,500 to 2,500 francs to purchase a lantern for schools or small halls capable of throwing the image on a screen 2 to 2.5 meters wide, sufficient for a hall containing 200 or 300 people. The price of hiring educational and agricultural films at the present time is 4 centimes per metre and representation, or 10 centimes a metre per week. Hence the hire of a film of 100 to 200 metres, that takes five to ten minutes to show on the screen, is 4 to 8 francs for one representation and 10 to 20 francs for one week. The following are the titles of some of Messrs. Pathe and Gaumont's films:—The Crossing of Wheat; Mimicry; Karyokinesis in a Living Cell; The Germination of a Pollen Grain; The Vintage, &c. (''Revue de Viticulture,'' 1st March, 1923.)

Cotton Research and Teaching Institute in the Transvaal.

The Transvaal University proposes to found an Institute for Cotton Research to work in collaboration with the Department of Agriculture, Tobacco, and Cotton Division. Amongst other questions studied there will be the control of the plant and animal parasites of cotton, the formation of standards, the length and tenacity of the lint, the spinning quality of South African cotton, and the general development of the cotton industry. (Journal of the Department of Agriculture, Union of South Africa, vol. 6, No. 2, 1923.)

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT WARWICK.

1923.	OCTOBER.		NOVEMBER.		DECEMBER.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	5 34	5 50	5·4	6·8	4·51	6·31
2	5·33	5 50	5 3	6·9	4 51	6·32
3	5·32	5 51	5·2	6·10	4 51	6·33
4	5 31	5 51	5·1	6·11	4·50	6 34
5	5 30	5·52	5·0	6·12	4·50	6 35
6	5 29	5 52	5·0	6·13	4·50	6·36
7	5 28	5·53	4 59	6·13	4·50	6 36
8	5 27	5 53	4 59	6·14	4 50	6 37
9	5 25	5·54	4 58	6 14	4 51	6 37
10	5 24	5·54	4·57	6·15	4 51	6·38
11	5·23	5·55	4·57	6·16	4 51	6 39
12	5·22	5·55	4 56	6·17	4·52	6 39
13	5·21	5 56	4·56	6·18	4 52	6·40
14	5·20	5·56	4·55	6·18	4·52	6 40
15	5·19	5 57	4 55	6·19	4·53	6·41
16	5·17	5·58	4 54	6 20	4 53	6·41
17	5 16	5·58	4·54	6·20	4 53	6·42
18	5·15	5 59	4·53	6 21	4·54	6·42
19	5·14	6 0	4·53	6·22	4 54	6·43
20	5·13	6 1	4 52	6·23	4·55	6·43
21	5·12	6·1	4·52	6·24	4 55	6·44
22	5·11	6 2	4 52	6·25	4·56	6·45
23	5·10	6·3	4·52	6 25	4·56	6·45
24	5·9	6·3	4 52	6·26	4·57	6·46
25	5 9	6·4	4 51	6·27	4·57	6·46
26	5·8	6·4	4·51	6·28	4·58	6·47
27	5·7	6·5	4 51	6·28	4·58	6·47
28	5·7	6·5	4 51	6 29	4·59	6·48
29	5 6	6 6	4·51	6·30	5 0	6·48
30	5 6	6 7	4 51	6·31	5·0	6·49
31	5·5	6·7	...	...	5·1	6·49

PHASES OF THE MOON, OCCULTATIONS, &c.

3 Oct. ☽ Last Quarter 3 29 p.m.
10 „ ● New Moon 4 5 p.m.
17 „ ☾ First Quarter 6 54 a.m.
25 „ ○ Full Moon 4 26 a m.

Perigee Oct. 11th at 1·42 p.m.
Apogee Oct. 26th at 12·36 p.m.

The moon will be apparently very close to the planet Mars on the 9th at 4·49 a.m., just before sunrise. About seven hours later the moon will be in conjunction with the planet Mercury. Shortly afterwards Venus and Saturn will be in conjunction at 3·47 p.m. On the 17th at 9 p.m. Saturn will be in conjunction with the sun.

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2 Nov. ☽ Last Quarter 6 49 a.m.
9 „ ● New Moon 1 27 a.m.
15 „ ☾ First Quarter 7 41 p.m.
23 „ ○ Full Moon 10 58 p.m.

Perigee 9th Nov. at 1 a.m.
Apogee 22nd Nov. at 12·54 p.m.

Neptune will be in conjunction with the moon on the 3rd at 5·47 a.m. Venus and Jupiter will be in conjunction on the 5th at 6·11 a.m about 15 degrees east of the sun and setting about an hour later than it. Mercury will be in superior conjunction with the sun on the 16th at 10 a.m., passing it on the far side from west to east. It will be in conjunction with Jupiter on the 20th at 3·53 p.m.

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8 Dec. ● New Moon 11 30 a.m.
15 „ ☾ First Quarter 12 38 p m.
23 „ ○ Full Moon 5 33 p.m.
31 „ ☽ Last Quarter 7 7 a.m.

Perigee 7th Dec. at 1 p.m.
Apogee 19th Dec. at 9·12 p.m.

The planets Mars and Saturn will be in conjunction but apparently separated by three diameters of the moon on the 2nd at 5·42 p.m. Saturn will be in conjunction with the moon but more than three diameters above it at 9 a.m. on the 5th. About two and a-half hours later Mars will be in conjunction with the moon but a good deal further above it. Mercury will be at its farthest distance east of the sun on the 28th at 2 a.m., setting about an hour and a-half after it.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

WATER CONSERVATION IN QUEENSLAND.

THE WORK OF THE IRRIGATION COMMISSION.

The Irrigation Act of 1922, a measure designed on broad lines and suited to modern conditions, became operative in October last year and the First Annual Report of the Commission administering the Act is now available.

It is obvious that, whilst already large sums have been expended by Queensland Governments in bores and water facilities, still larger expenditure is essential in order to cope with the requirements of extensive settlement projects now developing, and to more effectively serve areas already settled.

The Commission proposes to organise the State into water districts and facilitate the conservation of water by Boards, Trusts, Groups, and individual settlers.

Financial considerations, however, preclude any immediate general scheme of operations, but it is agreed that by a systematic and intelligent expenditure of regular and reasonable amounts much good should result, and eventually the problem of effective water supply should be solved at a cost sufficiently low to make the work profitable and beneficial to the farming and pastoral industries particularly and the whole of the State generally.

The Irrigation Commission, in its First Annual Report, surveys the water supply and conservation works now in progress, or in contemplation, in various parts of the State both interestingly and comprehensively.

The Irrigation Act of Queensland became law in October, 1922, but some preliminary survey work on various irrigation proposals had already been undertaken, and this work became the starting point for the more active prosecution of subsequent irrigation investigations. The Act having specially authorised the initial works in connection with the Dawson Valley scheme, that undertaking was commenced last January, and work has progressed so satisfactorily that it is anticipated the first 5,000-acre section will be under irrigation in 1924. Up to the end of last June over 3,300 miles of levelling had been completed on contour surveys. Further work on this, one of the newer projects, is fully described in the report from which the following particulars are taken:—

THE DAWSON RIVER UNDERTAKING.

Though the Dawson Valley Railway is now being built, it is not sufficiently advanced for use in the transport of irrigation construction material or supplies, necessitating the establishment of a base depôt at Rannes. This entails 70 miles of haulage for all material, and, owing to the expense and slowness of wagon teams, a fleet of heavy Leyland motor transports has been purchased, and supplies are now being rapidly and economically handled in this manner. The necessary road construction has been carried out, and fuel and water bases established. The effect of the transition from horse to motor transport has been to reduce haulage from £5 per ton to about 30s. per ton, in addition to ensuring prompt and regular deliveries of material.

Another important economy effected has been in the timber supplies. A saw and planing mill of modern type has been erected on the area, and the best of hardwood is being turned out at a considerably lower cost than the purchased timber. Thus the

forest logs, which in the process of clearing would have been burnt and wasted, are utilised to the fullest extent, with consequent economy in the work of construction.

The preliminary 5,000-acre section will be served by a temporary pumping station, but the channel system has been designed so that it becomes an integral part of the larger gravitation scheme when the latter is completed.

A Model Township.

A model garden township is in progress of construction, several cottages being completed and occupied. The reticulation of the township is almost completed, and the pumping-station and power-house for generating electric current should be running by the end of 1923.

Adjacent to the township an experimental and demonstration farm of 150 acres has been cleared, fenced, and channelled, and is now being laid out for planting. The farm is situated on land which is regarded as the average texture and quality prevailing on the area. An experienced irrigation farm manager, from South Australia, is in charge of this section of the work, and it is confidently anticipated that the farm will prove of great value and assistance to settlers on the area.

The Castle Creek Section.

The general canal work on the Castle Creek 5,000-acre section is well advanced, roads and streets cleared and improved, and the survey of the individual farms is proceeding apace. This section will be in the inner zone of farms, set apart for intensive cultivation, and will comprise about 350 blocks. The Dawson scheme generally is designed on the zone system, the smaller intensive cultivation blocks in the centre, with farms of gradually increasing size as the distance from the central point of settlement increases. At each central point will be the township serving its own zone, and connected with the Dawson Valley Railway. The system is a new departure in designing irrigation settlements, and the general conformation of the area lends itself admirably to the innovation. Each zone is designed to include approximately 40,000 irrigated acres, with 40,000 acres of dry area served by a stock and domestic water supply, the latter area having a proportion of irrigated land attached to each dry holding, the dry and irrigated portions being connected with each other. Five zones, each of equal area, are included in the general design.

At Nathan Gorge.

The main Dawson storage will be held behind an arched concrete dam at Nathan Gorge (so called after the Right Hon. Sir Matthew Nathan, Governor of Queensland), the estimated storage being 2,485,000 acre feet, the largest in the world at present. The submerged area will be 83,177 acres, principally second and third class land. This immense storage has been rendered advisable by a study of the behaviour of the Dawson River over a period of years, and is considered necessary to ensure the safety of the extensive areas of land that will ultimately depend upon it. So far as surveys indicate at the present, an area of approximately 200,000 irrigated acres can be served, in addition to a further 200,000 acres of dry lands receiving a permanent stock and domestic water supply.

The Nathan Dam will rise 130 feet above summer level of the river, with a crest length of 860 feet. A hydro-electric station at the dam will utilise the stored water power, and ample current can be generated for the requirements of the area. For a length of 27 miles the Dawson River will convey the stored water to the offtake weir, forming a secondary storage within the river bed, backing up to the foot of the Nathan Dam. The offtake and regulator works will be situated at the secondary weir, and from that point the whole of the distributory system will be fed from the main gravitation canal.

A careful soil survey indicates the suitability of the Dawson Valley lands for irrigated culture. The soils range from light-red to dark sandy loam, with good capillarity, and excellent facilities for drainage. Analyses indicate a certain deficiency of lime in some portions, but as large natural deposits of lime exist on the area, this deficiency may easily be remedied.

The plates illustrating these notes are taken from the report, and are reproduced by the courtesy of the Irrigation Commission.

EXPERIMENTAL FARM
Reserve for Factories Etc
EIGHTH AVENUE
SEVENTH AVENUE
SIXTH AVENUE
FIFTH AVENUE
FOURTH AVENUE
THIRD AVENUE
SECOND AVENUE
FIRST AVENUE
BOULEVARD
Town Reserve
School Reserve
Recreation Reserve
RIVER
DAWSON
Scale of Chains
QUEENSLAND IRRIGATION COMMISSION
DAWSON RIVER IRRIGATION SCHEME
CASTLE CREEK SECTION
TOWNSHIP

PLATE 111.—IRRIGATING CANE AT INKERMAN.

PLATE 112.—ON AN INKERMAN CANE FARM.

Plate 113.—Whyenbah Bore (1,407,880 Gallons per Day).

Plate 114.—An Inkerman Well—Flow, 100,000 Gallons per Hour.

PLATE 115.—BONA VISTA BORE (1,115,360 GALLONS PER DAY.)

PLATE 116.—MAXWELTON NO. 7 BORE (321,000 GALLONS PER DAY).

Plate 117.—Offham No. 2 Bore (1,124,000 Gallons per Day).

Plate 118.—Euloia No. 9 Bore (273,000 Gallons per Day).

General Notes.

Paper Mulching Tests.

The Department of Agriculture and Stock is about to test the efficiency of paper mulch. The department has been supplied with a quantity of the patent mulch preparation known as "Pabco," which it will test on two separate plantations. One of the tests will take place on the plantation of Mr. M. Fox, at Cleveland, where smooth-leaf pineapples will be grown in double row in a soil typical of the pineapple land of the Redlands area. The other test will be on the plantation of Mr. F. M. Ruskin, of Zillmere. There the plants will be grown in single row in soil which is of a lighter nature than that of the Redlands. The Director of Fruit Culture (Mr. A. H. Benson) states that it is claimed for the mulch that it keeps the soil warm, prevents surface evaporation, and retards weed growth, thus decreasing cultivation costs.

Man's Deadly Enemy—the Fly Pest.

"Destroy the fly's breeding place by burning manure and other organic refuse."

"Keep covers on the sugar-basin, the jam pot, the milk jug."

"Guard all food from fly contamination."

One pair of flies in five months of warm weather may breed by successive generation as many as 4,000,000,000,000,000,000 descendants.

"Watch the fly being born on the manure-heap," writes a distinguished authority on flies. "Then observe it on the edge of the milk-jug. Look at its track on the window-pane or on a sheet of clean paper. Examine its legs with a magnifying glass, and then watch it drown in a cup of hot tea. Lastly, observe the flies swarming over a ham in a restaurant or settling on the sugar-basin. Ugh! When we know what they do, it is horrid!"

The fly is indescribably dirty. Each of its six legs has two claws, and between the claws are soft, sticky pads, surrounded by hairs which secrete a sticky fluid. The mouth consists of a proboscis, which ends in two flabby pads, which can be protruded and applied to all kinds of filth, to our food, and to our faces. Legs, hairs, bristles, mouth-pads, and proboscis, sticky with what the fly feeds on, harbour disease germs which live and multiply, and which the fly in its peregrinations distributes impartially among the dwellers of mansion and cottage.

Inside the fly's crop typhoid and cholera bacteria will thrive in its food, and then, after many hours, perhaps, the germs will be regurgitated into a baby's mouth or into the invalid's beef-tea. Or the germs can multiply in the digestive processes of the fly, and be passed on to the sugar or on to the spout of the milk-jug. If people generally knew what the bacteriologist knows about the fly they would be appalled at the stream of disease and death which follows in its trail.

Talking of the fly nuisance, Professor Harrison, of Sydney University, recalled his experience in Mesopotamia in 1916, when he was sent out from England by the War Office to see what could be done to relieve the troops, who suffered horribly from a plague of flies. "The flies were so numerous," he said, "that the men could not eat their food without also swallowing the pests. Dysentry and typhoid were rife in the camp, where the old system of sanitation practised by the military obtained."

"Professor Lefroy, representing the Indian Government, was with me," added Professor Harrison. "We set to work to incinerate refuse of all kinds. During July and August it was too hot for flies to live unless in sheltered places. In those months we destroyed every likely kind of breeding-place, and then sat down to wait. A few flies came out in October, but there was nothing for them to breed in. Result, no flies. Seeing that the air was black with them in the spring, their sudden disappearance had in it something of the dramatic.

"From Kut-el-Amara," continued the professor, "we went to Bagdad, where of course, our task was complicated by the native population. Nevertheless, by strict sanitary measures we managed to keep the pest down."

"Burying night-soil," he said, "does not ensure safety. A fly can come through 6 feet of loose soil and 3 feet of hard soil. The best way of disposing of nightsoil, as well as other refuse is by burning it. Organic refuse should not be allowed to accumulate. Garden manure should be safeguarded by powdering it with borax—to stop the flies from breeding in it. Besides being a pest, the fly is a positive danger in the dissemination of disease. The incidence of fly-borne disease dropped 50 per cent. in Mesopotamia as a result of clearing out the flies."

Bottle Trees as Fodder.

A large number of settlers in the Speedwell district have been utilising bottle trees for cattle fodder during the drought period. Mr. Vin. Potter has been feeding his herd exclusively on these trees for a full month, and claims that they have kept in good condition and maintained their milk supply throughout. Mr. Potter, who is very enthusiastic over the successful results of his experiment, particularly notes that the milk yield has not been adversely affected. He estimates that each bottle tree cut down realised a clear return of £3 10s. The older farmers will remember that this form of reserve fodder was extensively utilised during the severe drought of twenty years ago.—"South Burnett Times."

Ratoon Cotton—Field Tests.

The Minister for Agriculture and Stock (Hon. W. N. Gillies) has announced that field testing is being carried out on the Melton Farm in the Callide Valley. Annual cotton is being tested against ratoon cotton properly pruned and inter-cultivated, and against ratoon cotton indifferently pruned and improperly cultivated. A fourth plot will consist of stand-over cotton planted in March and allowed to stand over until the following season. Durango is the variety, as it is felt that really accurate results can only be obtained by using a pure type of cotton. Bales of annual and first year ratoon Durango cotton grown on Mr. Bailey's farm at Capella under identical conditions have been forwarded to the Agent-General for Queensland, with the request that he will arrange spinning tests with reliable firms who are not prejudiced in any way.

In addition, samples of ratoon and annual Durango cotton grown under conditions which are known have been forwarded to the Director of the British Cotton Industry Research Association, Shirley Institute, Didsbury, who has agreed to undertake a detailed investigation into the microscopic and other characters of ratoon cotton. This Institute is one of the foremost research laboratories in the United Kingdom, and the results of its investigations should throw a great deal of light on the differences that undoubtedly exist between annual and ratoon Upland cotton. The Premier (Hon. E. G. Theodore) also proposes to make inquiries on cotton matters when in England in the coming year.

Fruit Packing Classes—Queensland System Commended.

Thus the "Australasian," 24th November, 1923:—Excellent work is being performed by the Agricultural Department of Queensland in training children in fruitgrowing districts in the best methods of packing fruit for market. . . . Since May last the Queensland Department of Agriculture has inaugurated no fewer than sixty-five classes. Already the benefits of the system are apparent in the better manner in which the fruit is packed on the market, and in the increased prices which growers have been obtaining for their fruit. It is true that the Victorian Department has conducted a few classes, but in comparison with the Queensland system many faults are evident. These are due to the department, and not to the instructor. Very little benefit accrues as a result of a packing class being held, as often is the case, for one day in the season, and it may be contended with equal fairness that when these have been continued over a period of five or six days the results are not so good as are those obtained in Queensland, where the classes are conducted throughout the season. The plan adopted there is to work with the Education Department, and to visit schools in the fruitgrowing districts. Growers are asked to supply the fruit needed, and it is to their credit they have responded well to the invitation. On the formation of a class, a lesson extending throughout the afternoon is given, and is followed by another perhaps a week later, until such time as the pupils thoroughly understand what is required of them. From this on the lessons may be given at less frequent intervals, according to the progress made, but the classes are visited periodically to see that the children are carrying out the work satisfactorily, and to correct any faults that may require attention. The advantage of this system is that with the practice the children obtain at home they rapidly become proficient, and when difficulties arise they are explained and more readily understood at the subsequent though less frequent lessons, that may be necessary as the season advances. Very little has been done in this direction in Victoria, and the value of the work has been reduced owing to the failure of the department to enable its instructor to follow it up. Another point in this connection is that the children are not only shown how to do the work, but they are obliged to do it in the presence of the instructor, who is then able to point out faults that may occur. In view of the approach of the fruit season, it is desirable that a number of classes should be organised, and that the services of the packing instructor should be used solely in this class of work. At present he is engaged in the work of orchard supervision, though owing to the citrus season there is no reason why he should not be engaged in conducting packing classes all the year round.

Sugar Exports in the Form of Manufactured Goods.

The Melbourne correspondent of the "Sugar Journal" (9th November, 1923), writes:—"I am not prepared to deny that Australia can export even ordinary sugar, but it is quite certain that she can export sugar in various forms—namely in those of jams, canned fruits, biscuits, milk, infants' and invalids' foods, confectionery, &c. The latest detailed figures are for the year ending June, 1922, and these show the value of exports as follows:—Biscuits, £173,744; confectionery, £77,094; preserved fruits, £787,246; infants' and invalids' foods, £228,640; jams and jellies, £164,045; beer, &c., £77,431; while the exported manufactured tobacco, approximating £500,000, also contains an appreciable amount of sugar, as disclosed in Parliament about 1907. The forms in which sugar can be exported are legion, but the most important at present is the sugar content of preserved and concentrated milk, the export value of which in the year I am quoting was close upon £2,000,000 sterling, and the actual weight 33,286,900 lb., 40 per cent. of which was sugar."

Some Sugar Figures.

Thus a writer in the "Australasian" (Victoria) of 24th November:—Undue prominence and many misleading statements have been made regarding the relation the cost of sugar bears to the unsatisfactory position of those engaged in the production of canning fruits. It is generally believed by those unaware of the true position that the embargo placed upon the importation of sugar has disastrously affected trade. Yet, if sugar prices, as they stand at present are examined, it will be found that Australian 1A sugar can be used in the manufacture of jams and canned fruits for the overseas trade to the United Kingdom in preference to the imported article. Java white sugar, which contains a percentage of molasses, making it unsuitable for use for jam unless the preserve is used within a period of approximately twelve months, may be obtained for £35 6s. 8d. a ton. Java brown, after being refined, will cost £40 5s. 3d. per ton. On the other hand, Australian 1A sugar costs £35 13s. a ton. On these figures the difference in the cost of a ton of sugar is in favour of Java white to the extent of 6s. 4d. a ton. If the jam or canned fruit is exported to the United Kingdom that made with the Australian sugar receives a rebate of £6 a ton, plus £4 5s. 8d., as Empire preference, which reduces its cost to £25 7s. 4d.; whereas the Java white, receiving only a drawback of £9 6s. 8d., on account of being re-exported, would cost £26 a ton, or 12s. 8d. a ton more than the better quality Australian-grown sugar. In similar circumstances the Java brown would cost £30 18s. 7d. a ton. If, however, the jam and preserves are sent to places other than the United Kingdom, Australian sugar would cost £29 13s. a ton, as compared with the Java white at £26 a ton. It is important to remember that the export rebate on sugar used in the manufacture of these commodities is based on the world's parity of the article. *It is admitted that the cost of sugar is of little consequence in connection with the canned fruits trade.*

Importation of Sugar.

The same writer continues:—Since the above figures are based on present prices, the fact cannot be disregarded that the price of sugar in other parts of the world may fall considerably in value. For more than five years the price of Java sugar has not declined below £16 5s. a ton, at which price, owing partly to its inferiority for use in jam manufacture, it is unlikely to be imported, assuming imports were permitted. This statement is supported by the fact that during the period from June to 6th December, 1921, manufacturers were at liberty to import their requirements. At that time there was a phenomenal slump in sugar, and it was obtainable from Cuba at £13 a ton, f.o.b., which is equal to £25 a ton refined and landed in the factories in Australia. Yet during this period, and despite the attractiveness of the opportunity to purchase on a low market, only 822 tons were purchased. Manufacturers certainly had a great advantage over those in other countries during the war period, and it is not improbable that a benefit will accrue to them again this year. This year there is the prospect of a world's shortage of sugar, for the Cuban estimates indicated there would be a yield of 4,105,000 tons, but on revised figures the production is set down at 3,601,000 tons, showing a diminished yield of more than 500,000 tons. One other factor which weighs in favour of the use of the Australian-grown article is that whereas it would be necessary to incur an enormous outlay in order to purchase some thousands of tons of sugar from outside sources, and bear this expenditure until eventually the jams or preserves had been manufactured, sold, and paid for, the manufacturers, who use annually about 23,000 tons in the fruit industry, are able to purchase their needs in quantities to suit their immediate requirements. Provision is made for meeting the demands of the consumer who wishes to utilise fruit for the manufacture of jam or for preserving by making it available through the Housewives' Association at 4d. a lb. at the refinery in place of the retail price of 4½d. a lb.

Australian Forest Botany.

"An Elementary Text Book of Australian Forest Botany," Vol. I., by Mr. C. T. White, F.L.S., Queensland Government Botanist, just published, has received very favourable notice in a bulletin issued by the Royal Botanic Gardens, Kew.

A Dishonest Practice.

The very high prices ruling for locally-grown potatoes have caused some growers to become regardless of the risks appertaining to what is termed "topping." At the Roma street markets recently a consignment of twenty-five bags, on being opened, was found to be mixed. The tubers on the top of the bags were of fairly good quality, whereas in the middle of the bags were potatoes only a little larger than marbles. For the information of growers who resort to this practice, it is pointed out that the departmental inspectors have power to take action with a view to prosecution.

South African Maize Shipments.

The assertion that large quantities of South African maize, grown by black labour, were being, or were about to be, imported into Queensland and the other States was referred to by the Premier (Hon. E. G. Theodore) recently.

"I think it is an unfortunate fact," Mr. Theodore said, "that maize grown by cheap labour is being dumped into Australia. I cannot say off hand what effect it will have upon our own industry.

"We have asked the Commonwealth Government for further protection, and I think the matter is being considered by the Tariff Board."

New Fruit Case Regulations.

The regulations lately in force in conformity with the provisions of the Fruit Cases Acts have been cancelled, and recently a new set received the approval of the Governor in Council. The new regulations define the meaning of "matured fruit" and of the term "packer" and stipulate that brandings on cases shall be obliterated with white water paint, instead of being removed by scraping. Under the new rules less marking is required on pineapple cases, the grade of the fruit contained in each of which will be indicated by the number of pineapples it holds. It is further provided that an inspector may seize any cases or fruit which, in his opinion, are being sold contrary to the Act or regulations.

A Jersey Test.

The secretary of the Jersey Cattle Society of Queensland advises that the cow, Lily of the Valley, the property of Mr. Thomas Thomson, Lover's Walk, Bundaberg, has completed the 273 days' test for the Advanced Register of the Herd Book. Lily of the Valley was four years and ten months old at the beginning of the test. She yielded 8,251⅛ lb. milk and 527.77 lb. butter fat, equal to 620.90 lb. butter, in the period.

The secretary draws attention to the fact that this record has been made in a season which is probably the worst which Queensland has experienced in this decade. The performance shows what sort of production would be possible in most of our good herds if adequate feed were always available, as, indeed, it should be.

Bad Show-Ring Losers.

The man who takes his defeat in a show-ring with a smile, and who congratulates the winner, sows seed of good will which is sure to produce an abundant harvest later on. He places himself in a position where everyone is glad to help him, and where no one will begrudge him any successes he may win in later years. The chronic grouser, on the contrary, builds a wall about himself through which no one cares to try to penetrate. He shuts himself off from benefits which would be his were he of a better disposition. Smile when you like. Remember you cannot lose by a smile.

Every man who shows his animals should profit by that showing, whether he bears away the victor's crown or tastes defeat. There are always reasons why he wins or why he loses. It is his duty to ascertain what those reasons are. Unless he does ascertain them he is not getting out of the show ring all that he ought to get out of it.—"Live Stock Journal."

Queensland Bananas.

A large consignment of bananas of the Cavendish variety recently attracted attention at the fruit markets. The consignment came from the North Coast, and consisted of sixty-eight bunches, containing 700 dozen. The whole line was well developed, and free from skin blemishes. There was no difficulty in finding a buyer at 9½d. per dozen.

A Cane Harvester.

"The Commonwealth authorities have approached the Queensland Government respecting the use of the Luce sugar-cane harvester," remarked the Premier (Hon. E. G. Theodore) recently. "This harvester," he continued, "is manufactured in the United States, and, apparently, has had satisfactory trials over there. I have pointed out to the Commonwealth authorities that it seems to us to be a matter for the sugar industry itself to try out the machine, and satisfy itself as to its prospects."

Control of Prickly-pear by Natural Enemies.

The Brisbane Chamber of Commerce has received a letter, through the Associated Chambers of Commerce, from the Prime Minister's Department, stating that the Commonwealth Government was co-operating with the State Governments of New South Wales and Queensland in a comprehensive investigation of the possibility of controlling prickly-pear by the introduction of natural enemies (insects and fungoid diseases), which attack the pear but which will not attack other plants. As soon as experiments are completed and results satisfactory, steps will be taken for the breeding of large numbers of the insects and for their liberation in various suitable localities.

Trade in Farmers' Requirements.

The trade, according to local market reports, for heavy hardware is very quiet except for building lines, in which there is again a fair movement. A good trade in paint materials and oils is reported. Following are distributors' quotations:—Barb wire, American Iowa, 12 gauge, £31; barb wire, American Iowa, 14 gauge, £32 10s.; plain black, No. 8, £21; plain black, No. 10, £22; plain galvanised, 8 gauge, £24; plain galvanised, 10 gauge, £25; wire netting, regular sizes, new list less 45 per cent. net; corrugated iron, 24 gauge, 5 to 8 feet, £31; corrugated iron, 26 gauge, 5 to 8 feet, £32 10s.; case lots only f.o.r. or f.o.b., 9 feet, 10s.; 10 feet 20s. per ton extra.

The Cotton Industry Act in Operation.

Having received the Royal Assent, the Cotton Industry Act is now in operation. One of its most important provisions is that placing an embargo on the growing of ratoon cotton.

This is dealt with in section 13 of the Act, which provides:—"(*a*) No ratoon cotton plants shall be grown. (*b*) No person shall send ratoon cotton to an authorised factory. (*c*) No person shall grow any cotton plants within the State except for commercial purposes." The section further sets out that "any person who contravenes any of the provisions of this section shall be liable to a penalty not exceeding £50."

Wheat Tests.

The whole of the wheat tests made by the Department of Agriculture on plots at the farm of Mr. H. Geitz at Allora have proved fairly successful.

Mr. C. S. Clydesdale (Assistant Instructor in Agriculture), who recently visited the Allora district for the harvesting of these plots, states that their success was mainly due to the light nature of the soil in which the wheats were grown. A fair percentage of the wheat crops in the Allora district had returned sufficient seed wheat for next season, and there was a small surplus. The new varieties introduced by the department had in the majority of cases returned seed wheat,

while one crop returned approximately six bags. The general harvesting was almost completed, and the preparation of land for maize crops was being carried out. In some instances the maize was well above the ground, but rains were required early to ensure its initial success.

The Empire Exhibition—Queensland's Effort.

"Queensland will be prominent in the Empire Exhibition especially in relation to meat, wool, forestry, minerals, cotton, sugar, and tropical and agricultural products, whilst in the secondary industries this State will send forward a representative assortment of manufactured goods. The manufacturers of Queensland have displayed commendable interest in preparing and assembling exhibits, which will give the millions of visitors at Wembly Park some idea of the advancement made by this State in secondary manufactures," said the Minister for Mines (Hon. A. J. Jones), who is also chairman of the Queensland Commission to the Empire Exhibition, recently. The Minister recently attended a meeting of the Australian Commission. In the course of a Press interview, Mr. Jones said that the preparations for Australia's participation in the Exhibition were well in hand, all of the State Commissions having worked enthusiastically for some time past to secure an adequate representation of the varied primary and secondary industries of Australia.

Mr. Jones further remarked that at least 75 per cent. of the meat exhibit would be supplied by Queensland. The quota of wool from this State was 276 fleeces and about six bales of scoured wool. The beautiful cabinet woods of Queensland would be displayed in many parts of the Australian pavilion, and the raw material of the forest as well as the finished article, in the form of artistic furniture and inlaid fancy woodwork, would be in evidence.

Continuing, Mr. Jones said that the Queensland representatives had induced the Australian Commissioners to endeavour to arrange for the propeller of the Vickers Viking aeroplane, piloted by the late Sir Ross Smith and his brother Sir Keith Smith, from London to Australia, to be exhibited at Wembly Park. This propeller was made at the Ipswich Workshops as a gift to the aviators after a forced descent at Charleville had damaged the original propeller so severely that a continuation of the flight with it was impossible.

Mr. Jones added that arrangements were practically complete for the films of Australia to be shown at the Exhibition. Pamphlets relating to the industrial and social life of Australia had been compiled and would be distributed overseas in large numbers. The Commission decided to ask the Commonwealth Government to provide a map illustrating the land, sea, river, and aerial transport facilities in Australia. Each State was being asked to nominate an assistant attendant for the live stock exhibit, which comprised thirty-two stud rams.

On the subject of the granting of official status at the Exhibition to representatives of Australian secondary industries, Mr. Jones pointed out that it was the view of the Australian Commission that the manufacturers should be adequately represented at the Exhibition without expense to the Commisison. The Commission suggested that one accredited representative should be appointed for each section, and that the several Chambers of Manufactures should be asked to classify the sections. The principle of this decision, he stated, would apply to all other industries as well as the manufacturing industry.

Mr. Jones also mentioned that the Commission approved of the suggestion that exhibitors or their representatives co-operate with the Commission's officers in the display of exhibits, the approval being subject to the maintenance of the Commission's authority in the matter. In conclusion, the Minister said that Queenslanders would be proud of the part which their State had taken to show the world what they produced and of what they were capable of producing and manufacturing. He was an ardent advocate of Australian made goods for Australian people. He hoped that one result of the Exhibtion would be the establishment of a greater number of secondary industries in Australia. What America had done, Australia also could do—probably better.

Back Numbers of the Journal.

Back numbers of the "Queensland Agricultural Journal" are available for distribution to farmers, cost free. Readers requiring them are advised to apply to the Under Secretary, Department of Agriculture and Stock, Brisbane.

To Correspondents.

Correspondents seeking information through the Journal are advised to address all inquiries to the Under Secretary, Department of Agriculture and Stock, Brisbane. Letters on official matters should not be addressed to the Editor personally.

State Wheat Board.

Mr. F. J. Morgan has been appointed chairman of the State Wheat Board for one year as from the 2nd December, 1923, and Messrs. R. Swan, A. J. Harvey, B. C. C. Kirkegaard, T. Muir, J. T. Chamberlin, and F. J. Morgan have been appointed members of the Board for one year as from the 2nd December, 1923.

Staff Changes.

Mr. J. H. Hurley, Police Constable, has been appointed Inspector of Slaughter-houses.

The resignation of Mr. J. M. Ward, Chief Instructor in Fruit Culture, has been accepted as from the 31st December, 1923. Mr. Ward has been appointed by the Victorian Government to the newly created Directorship of Horticulture in Victoria.

Stallions Registration Act.

Regulations have been issued under "*The Stallions Registration Act of* 1923" to take effect on and from the 1st January, 1924. These regulations provide that the form of application for registration of stallions shall be in a prescribed form, together with the form of statutory declaration. Regulation 3 provides for the examination of stallions, and a certificate will be refused for any stallion suffering from any hereditary defects. The registration fee is fixed at 20s., and each renewal thereof will cost 10s. Should the owner of a stallion be dissatisfied with a decision of the Board to refuse a certificate to his stallion, he shall have the right of appeal against that decision.

Standing Committees, Council of Agriculture.

In lieu of those constituted in April, 1923, the following Standing Committees of the Council of Agriculture have been formed:—

Executive: Messrs. G. H. Pritchard, T. Flood Plunkett, C. Bateman, W. Ranger, A. E. J. C. K. Graham.

Dairying: Messrs. A. McKinlay, A. E. J. C. K. Graham, J. Hardcastle, T. F. Plunkett, R. Swan, J. T. Tatnell, J. T. Todd

Fruit: Messrs. W. Biggs, T. H. Brown, W. Ranger, F. M. Ruskin, C. Bateman.

Sugar: Messrs. W. G. Batchler, W. Biggs, T. A. Powell, G. H. Pritchard, H. T. Easterby.

Transport: Messrs. W. G. Batchler, J. W. Davidson, A. Evans, A. McKinlay, W. Ranger, J. H. Sigley, R. Swan.

General Agriculture: Messrs. C. Bateman, R. K. Boyd, G. Burton, T. C. Hayes, A. Evans, H. C. Quodling, J. H. Sigley.

Dingo Board Elections.

Messrs. J. Ferrier, P. A. McNicol, R. F. Douglas, and H. E. Ferrier have been elected members of the Booringa Dingo Board. Mr. H. J. Hearn has been appointed Government representative.

Messrs. D. S. Paterson, S. Blackstock, J. F. Banks, and D. G. Evans have been re-elected members of the Barcoo Dingo Board, and the Police Magistrate, Blackall, has been appointed Government representative.

Pest Destroyers Act.

Regulations have been issued under "*The Pest Destroyers Act of* 1923" which provide for a notice to be given by a dealer, other than a wholesale dealer, and also require such dealer to forward particulars of the wholesale dealers from whom he obtains or proposes to obtain such pest destroyer. A form of notice is also provided to be given by a wholesale dealer, together with a form of particulars of the name and address of the manufacturer of the pest destroyers in which he deals. The Act provides that every such notice by a wholesale dealer shall be accompanied by a fee of five shillings, provided that the total sum payable by any dealer, by way of such fees, shall not exceed one pound in any one year. The statutory declaration required by subsection 3 of section 3 of the Act shall be in Form No. 5 of Schedule I. to the Regulations. Schedule II. provides definitions and standards for substances declared to be pest destroyers. Every wholesale dealer is required, on or before the delivery of any pest destroyer to the buyer, to affix to every package of such pest destroyer a label conforming in all respects to the label furnished to the Under Secretary, Department of Agriculture and Stock.

The label affixed to pest destroyers containing substances of a poisonous nature shall bear in red letters, in larger type than any other letter on the label and on the first line of such label, the word "Poison." All pest destroyers of a poisonous nature, in addition to having the prescribed label affixed, shall be contained in receptacles which will be readily distinguished from any other bottle or jar. In the case of casks, &c., containing poison in bulk, in addition to the label, the immediate container shall be firebranded with the word "Poison" on the side and top in letters not less than three-quarters of an inch in height, and in the case of tins or other metal containers, the word "Poison" shall be embossed or impressed on the side and top of each container in letters not less than five-sixteenths of an inch in height. Every dealer who sells any pest destroyer of greater value than 5s. shall, on or before delivery of such pest destroyer, sign and give to the buyer an invoice setting out the name and address of the dealer, the net weight or imperial measure, and the name of the pest destroyer, and a warranty to the effect that the constituents and percentages of the pest destroyer sold accurately correspond with the constituents and percentages stated in the statutory declaration furnished to the Under Secretary, Department of Agriculture and Stock, Brisbane. Regulation 8 provides for a scale of fees payable by any dealer or manufacturer for the analysis of any pest destroyer. Regulation 9 provides for a fee of 10s. 6d. payable by any buyer other than a dealer for the analysis of any pest destroyer, and provides also for the method of obtaining such analysis. The label and directions for use shall not contain any statement which is false or misleading in any particular concerning the substances referred to. Any person who causes or permits any label to be false in any particular shall be guilty of a breach of the Regulations, and will be liable to a penalty not exceeding £20.

Agricultural Societies—Subsidies and Duties.

When, upon the motion of Mr. Pugh, M.L.A., in 1867, Parliament granted subsidies to agricultural societies, it was clearly the intention, and that intention still holds good, that the subsidy is intended for the advancement and encouragement of agriculture and stock-raising; also that it should be used for that object in other ways than by holding a yearly show. To-day, however, an agricultural society considers its existence fully justified if it holds a show once a year and then goes into recess until the time arrives for the preparation for the succeeding event. And even at the annual show the operations are not equally divided between agriculture and stock; the latter have far the greater share of the prize money, and the result is that the agricultural exhibits are falling off in quality and quantity—a state of affairs that is not to be wondered at with the poor encouragement offered. It is to be admitted that horses, cattle, sheep, swine, poultry, and other live stock, are components of farming, but in the economy of agriculture the first place must of necessity be allotted to production, but at agricultural shows it has to be content with second place. Ring events draw the public, but here again the intention of Parliament is being defeated, because, owing to the better prize money, the horse competitions, instead of encouraging the local improvement of horses, have called into being a professional show class which travels from show to show, and so the local man is discouraged. Seldom are there to be seen in a show programme any prizes offered of purely local character, but instead they are for open competition, of which the professional owners are not slow to take advantage. The first care of an agricultural society should be the primary products and the direct manufactures from them, for upon them the whole well-being of the rural community is built.

Answers to Correspondents.

Remedy for a Self-sucking Cow.

"DAIRYMAN" (Kumbia)—The Director of Dairying (Mr. E. Graham) advises:—

It must be first ascertained whether the cow sucks her teats while lying down or in a standing position. (Cows may suck in either position.)

In the latter case, a moderately efficacious means of overcoming the trouble is to affix upon the cow a head-stall, with a nose-piece comprised of stout leather, and through the nose-band ordinary 3-inch wire nails are driven, the pointed ends being exposed, and to keep the nails from retracting a strip of tin fastened to the leather band over the heads of the nails, the points of which may be sharpened, if necessary, with a file, or upon a grindstone. The points of the nails prick the hide of the cow whenever she attempts sucking.

When a cow sucks her teats while lying down, the foregoing remedy may not always prove satisfactory, as frequently, when the animal is lying at rest, the teats may be sucked by the cow without bringing the points of the nails into contact with her flanks. To meet such cases, take a triangular-shaped piece of light wood, cut off the apex several inches down the triangle, and hollow the remaining piece of wood directly below the cut, leaving the edges of the wood available to fit into the nostril cavities, and thereby gain support for the piece of wood which falls over the mouth of the animal and debars her from sucking, but leaves her at liberty to graze and take water.

If heavy wood is used, or the points of wood which act as a hinge are left in a rough condition, the nose of the animal may become chafed as a consequence.

Many experienced dairymen remove from the herd any animal that develops the habit of "sucking," but possibly there are exceptional cases where the application of remedial measures is warranted.

The Director of Agriculture (Mr. H. C. Quodling) replies to a correspondent as follows:—

Rhodes Grass.

Rhodes grass grown on rather poor soil near Brisbane was compared with locally-procured good-looking samples of chaff. Analyses showed that practically double the value of protein contents were present in Rhodes grass as compared with the oaten and wheaten chaff. An analysis of samples of Soudan grass grown at Gatton College and Hermitage State Farm also showed protein content considerably higher than that of oaten or wheaten chaff. (A table of analyses will be published in the January Journal.)

Ringing or Falling Brigalow or Ti-tree Scrubs—Which is the Better Method?

This depends largely on what noxious weeds are present or prevailing in the district. Ringbarking brigalow in localities which are pear infested is not recommended, but in the absence of prickly-pear it is a cheap and effective method. The area may ultimately be burnt off by a system of "Yankee" grubbing. Where there is a risk of encouraging the growth of noxious weeds by this method it would probably be better to fall and subsequently burn before any weed growth becomes evident. The period which timber should be left before firing depends on the time of the year at which it was felled, but fallen scrub should obviously be dry enough to ensure a good burn. Lopping after falling would help towards ensuring a clean burn.

"Cotton Bush."

There are several plants known by the name of "Cotton Bush," some of which are very free seeding in their habits. Without a specimen it would be difficult to say definitely whether the plants would be self-exhausting or not. It would be far wiser to take no chance and to use every means of eradication.

Farm and Garden Notes for January.

FIELD.—The main business of the field during this month will be ploughing and preparing the land for the potato and other future crops, and keeping all growing crops clean. Great care must be exercised in the selection of seed potatoes to ensure their not being affected by the Irish blight. Never allow weeds to seed. This may be unavoidable in the event of long-continued heavy rains, but every effort should be made to prevent the weeds coming to maturity. A little maize may still be sown for a late crop. Sow sorghum, imphee, Cape barley, vetches, panicum, teosinte, rye, and cowpeas. In some very early localities potatoes may be sown, but there is considerable risk in sowing during this month, and it may be looked upon merely as an experiment. Plant potatoes whole. Early-sown cotton will be in bloom.

As the wet season is expected to commence this month, provision should be made accordingly.

On coastal and intercoastal scrub districts, where recently burnt-off scrub lands are ready for the reception of seed of summer-growing grasses, sowing may commence as soon as suitable weather is experienced. Much disappointment may be saved, and subsequent expenditure obviated, by ensuring that only good germinable grass seed is sown, of kinds and in quantities to suit local conditions, the circumstance being kept in mind that a good stand of grass is the principal factor in keeping down weeds and undergrowth.

In all districts where wheat, barley, oats, canary seed, and similar crops have recently been harvested, the practice of breaking up the surface soil on the cropped areas should invariably be adopted. Soil put into fit condition in this way will "trap" moisture and admit of the rains percolating into the subsoil, where the moisture necessary for the production of a succeeding crop can be held, provided attention is given to the maintenance of a surface mulch, and to the removal, by regular cultivation, of volunteer growths of all kinds. If not already seen to, all harvesting machinery should be put under cover, overhauled, and the woodwork painted where required.

Where maize and all summer-growing "hoed" crops are not too far advanced for the purpose, they should be kept in a well-cultivated condition with the horse hoe. Young maize and sorghum crops will derive much benefit by harrowing them, in the same direction as the rows are running, using light lever harrows with the tynes set back at an angle to obviate dragging out of plants, but the work should not be done in the heat of the day.

Quick-maturing varieties of maize and sorghum may still be sown in the early part of the month in coastal areas where early frosts are not expected.

Succession sowings may be made of a number of quick-growing summer fodder crops—Sudan grass, Japanese and French millet, white panicum, and liberty millet (panicum). In favourable situations, both "grain" and "saccharine" sorghums may still be sown; also maize, for fodder purposes.

Fodder conservation should be the aim of everyone who derives a living from stock, particularly the dairyman; the present is an important period to plan cropping arrangements. Exclusive of the main crops for feeding-off (when fodder is suitable for this purpose), ample provision should be made for ensilage crops to be conserved in silo or stack. As natural and summer-growing artificial grasses may be expected to lose some of their succulence in autumn, and more of it in winter and early spring, the cropping "lay-out" to provide a continuity of succulent green fodder throughout the season calls for thorough and deep cultivation and the building up of the fertility and moisture-holding capacity of the soil. Planter's friend (sorghum) may be sown as a broadcast crop at the latter end of the month for cutting and feeding to cattle in the autumn and early winter. Strips of land should be prepared also for a succession sowing about the second week in February, and for winter-growing fodder crops.

KITCHEN GARDEN.—A first sowing of cabbages, cauliflower, and Brussels sprouts may now be made in a covered seed bed, which must be well watered and carefully protected from insect pests. Sow in narrow shallow drills; they will thus grow more sturdy, and will be easier to transplant than if they were sown broadcast. The main points to be attended to in this early sowing are shading and watering.

Give the beds a good soaking every evening. Mulching and a slight dressing of salt will be found of great benefit. Mulch may consist of stable litter, straw, grass, or dead leaves. Dig over all unoccupied land, and turn under all green refuse, as this forms a valuable manure. Turn over the heavy land, breaking the lumps roughly to improve the texture of the soil by exposure to the sun, wind, and rain. In favourable weather, sow French beans, cress, cauliflower, mustard, cabbage, celery, radish for autumn and winter use. Sow celery in shallow well-drained boxes or in small beds, which must be shaded till the plants are well up. Parsley may be sown in the same manner. Turnips, carrots, peas, and endive may also be sown, as well as a few cucumber and melon seeds for a late crop. The latter are, however, unlikely to succeed except in very favourable situations. Transplant any cabbages or cauliflowers which may be ready. We do not, however, advise such early planting of these vegetables, because the fly is most troublesome in February. For preference, we should defer sowing until March. Still, as "the early bird catches the worm," it is advisable to try and be first in the field with all vegetables, as prices then rule high. Cucumbers, melons, and marrows will be in full bearing, and all fruit as it ripens should be gathered, whether wanted or not, as the productiveness of the vines is decreased by the ripe fruit being left on them. Gather herbs for drying; also garlic, onions, and eschalots as the tops die down.

FLOWER GARDEN.—To make the flower-beds gay and attractive during the autumn and winter months is not a matter of great difficulty. Prepare a few shallow boxes. Make a compost, a great part of which should consist of rotten leaves. Fill the boxes with the compost; then sow thinly the seeds of annuals. Keep the surface of the soil moist, and when the young seedlings are large enough to handle, lift them gently one by one with a knife or a zinc label—*never pull them up by hand*, as, by so doing, the tender rootlets are broken, and little soil will adhere to the roots. Then prick them out into beds or boxes of very light soil containing plenty of leaf mould. Keep a sharp lookout for slugs and caterpillars.

All kinds of shrubby plants may be propagated by cuttings. Thus, pelargoniums, crotons, coleus, and many kinds of tropical foliage plants can be obtained from cuttings made this month. After putting out cuttings in a propagating frame, shade them with a piece of calico stretched over it. Be careful not to over-water at this season. Propagate verbenas, not forgetting to include the large scarlet Fox-hunter. Verbenas require rich soil. Palms may be planted out this month. If the weather prove dry, shade all trees planted out. With seed-boxes, mulch, shade, water, and kerosene spray, all of which imply a certain amount of morning and evening work, the flower garden in autumn and winter will present a charming sight.

Orchard Notes for January.

THE COASTAL DISTRICTS.

All orchards, plantations, and vineyards should be kept well cultivated and free from weed growth; in the first place, to conserve the moisture in the soil, so necessary for the proper development of all fruit trees and vines; and, secondly, to have any weed growth well in hand before the wet season commences. This advice is especially applicable to citrus orchards, which frequently suffer from lack of moisture at this period of the year if the weather is at all dry, and the young crop of fruit on the trees is injured to a greater or less extent in consequence.

Pineapple plantations must also be kept well worked and free from weeds, as when the harvesting of the main summer crop takes place later on, there is little time to devote to cultivation. If this important work has been neglected, not only does the actual crop of fruit on the plants suffer, but the plants themselves receive a setback.

Banana plantations should be kept well worked, and where the soil is likely to wash badly, or there is a deficiency of humus, a green crop for manuring may be planted. Should the normal wet season set in, it will then soon cover the ground without injury to the banana plants. When necessary, banana plantations should be manured now, using a complete manure rich in potash and nitrogen. Pineapples may

also be manured, using a composition rich in potash and nitrogen, but containing no acid phosphate (superphosphate) and only a small percentage of bone meal, ground phosphatic rock, or other material containing phosphoric acid in a slowly available form.

Bananas and pineapples may still be planted, though it is somewhat late for the former in the more southern parts of the State. Keep a good lookout for pests of all kinds, such as Maori on citrus trees, scale insects of all kinds, all leaf-eating insects, borers, and fungus pests generally, using the remedies recommended in Departmental publications.

Fruit fly should receive special attention, and on no account should infested fruit of any kind be allowed to lie about on the ground to become the means of breeding this serious pest. If this is neglected, when the main mango crop in the South and the early ripening citrus fruits are ready, there will be an army of flies waiting to destroy them.

Be very careful in the handling and marketing of all kinds of fruit, as it soon spoils in hot weather, even when given the most careful treatment. Further, as during January there is generally more or less of a glut of fresh fruit, only the best will meet with a ready sale at a satisfactory price.

Grapes are in full season, both in the Brisbane and Coominya districts, and in order that they may be sold to advantage they must be very carefully handled, graded, and packed, as their value depends very much on the condition in which they reach the market and open up for sale. Well-coloured fruit, with the bloom on and without a blemish, always sells well, whereas badly coloured, immature, or bruised fruit is hard to quit.

One of the greatest mistakes in marketing grapes is to send the fruit to market before it is properly ripe, and there is no better way to spoil its sale than to try and force it on the general public when it is sour and unfit to eat.

Bananas for sending to the Southern States require to be cut on the green side, but not when they are so immature as to be only partially filled. The fruit must be well filled but show no sign of ripening; it must be carefully graded and packed and the cases marked in accordance with the regulations under the Fruit Cases Acts and forwarded to its destination with as little delay as possible.

Pineapples should be packed when they are fully developed, which means that they contain sufficient sugar to enable the fruit to mature properly. Immature fruit must not be marketed, and if an attempt is made to do so the fruit is liable to seizure and the sender of the fruit to prosecution under the abovenamed regulations. Further, the fruit must be graded to size and the number of fruit contained in a case must be marked thereon. Immature fruit must not be sent. For canning, the fruit should be partly coloured; immature fruit is useless; and overripe fruit is just as bad. The former is deficient in colour and flavour and the latter is "winey" and of poor texture, so that it will not stand the necessary preparation and cooking.

Should there be a glut of bananas, growers are advised to try and convert any thoroughly ripe fruit into banana figs.

The fruit must be thoroughly ripe, so that it will peel easily, and it should be laid in a single layer on wooden trays and placed in the sun to dry. If the weather is settled, there is little trouble, but if there is any sign of rain the trays must be stacked till the weather is again fine, and the top of the stack protected from the rain. To facilitate drying, the fruit may be cut in half lengthways. It should be dried till a small portion rubbed between the finger and thumb shows no sign of moisture. It can be placed in a suitable box to sweat for a few days, after which it can be dipped in boiling water to destroy any moth or insect eggs that may have been laid on it during the process of drying and sweating. It is then placed in the sun to dry off any moisture, and when quite dry it should be at once packed into tight boxes lined with clean white paper. It must be firmly packed, when, if it has been properly dried, it will keep a considerable time. It can be used in many ways, and forms an excellent substitute for raisins, sultanas, currants, or other dried fruits used in making fruit cakes and other comestibles. Banana figs will be found useful for home consumption, and it is possible that a trade may be built up that will absorb a quantity of fruit that would otherwise go to waste.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

January is a busy month in the Granite Belt, and orchardists are fully occupied gathering, packing, and marketing the crop of midseason fruits, consisting of plums of several kinds, peaches, nectarines, pears, and apples. The majority of these fruits are better keepers and carriers than those that ripen earlier in the season; at the same time, the period of usefulness of any particular fruit is very limited, and it must be marketed and disposed of with as little delay as possible.

The advice given in the Notes for December, to send nothing but first-class fruit to market, still holds good. With the great increase in production, owing to the large area of new orchards coming into bearing and the increasing yields of those orchards that have not come into full profit, there is not likely to be any market for immature or inferior fruit. There will be ample good fruit to fully supply the markets that are available and accessible. Much of the fruit will not carry much beyond the metropolitan market, but firm-fleshed plums, clingstone peaches, and good, firm apples should stand the journey to the Central, and, if they are very carefully selected, handled in a manner to prevent any bruising, and properly graded and packed, they should carry as far as Townsville. Growers must remember that, given a market fully supplied with fruit, only such fruit as reaches that market in first-class condition is likely to bring a price that will pay them; consequently the grower who takes the trouble to send nothing but perfect fruit, to grade it for size and colour, to pack it carefully and honestly, placing only one sized fruit, of even quantity and even colour, in a case, and packing it so that it will carry without bruising, and, when opened up for sale, will show off to the best advantage, is pretty certain of making good. On the other hand, the careless grower who sends inferior, badly graded, or badly packed fruit is very likely to find, when the returns for the sale of his fruit are to hand, that after paying expenses there is little, if anything, left. The expense of marketing the fruit is practically the same in both cases.

Then "why spoil the ship for the ha'p'orth of tar" after you have gone to the expense of pruning, spraying, manuring, and cultivating your orchard? Why not try and get a maximum return for your labour by marketing your fruit properly? The packing of all kinds of fruit is a fairly simple matter, provided you will remember—

(1) That the fruit must be fully developed, but yet quite firm when gathered.

(2) That it must be handled like eggs, as a bruised fruit is a spoilt fruit, and, when packed with sound fruit, spoils them also.

(3) That only one-sized fruit, of an even degree of ripeness and colour, must be packed in a case.

(4) That the fruit must be so packed that it will not shift, for if it is loosely packed it will be so bruised when it reaches its destination that it will be of little value. At the same time, it must not be packed so tightly as to crush the fruit.

If these simple rules are borne in mind, growers will find that much of the blame they frequently attribute to the fruit merchants or middlemen is actually the result of their own lack of care. Fruit that opens up in the pink of condition sells itself, whereas any fruit that opens up indifferently is hard to sell on any except a bare market, and on a glutted market is either unsaleable or realises such a poor price that the grower is frequently out of pocket and would have been better off had he not attempted to market it.

If spraying with arsenate of lead, and systematic bandaging, has been properly carried out, there will be comparatively few codlin moths to destroy the later ripening pip fruits; but if these essential operations have been neglected or carelessly carried out, a number of moths will hatch out and the eggs laid by them will turn to larvæ that will do much damage, in some cases even more than that caused by the first broods that attack the fruit as soon as it is formed. Where there is any likelihood, therefore, of a late crop of moths, spraying with arsenate of lead must be continued if the late crop of pip fruits is to be kept free from this serious pest.

Fruit fly must be systematically fought, and on no account must any fly-infected fruit be allowed to lie about on the ground and breed this pest, to do further damage to the later ripening fruits.

Citrus orchards will need to be kept well cultivated in the drier and warmer parts of the State, and, where necessary, the trees should be irrigated. If scale insects are present, the trees should be either sprayed, or, better still, treated with hydrocyanic acid gas.

Western grapes are in full season, and if they are to be sent long distances by rail, then they are all the better to be cut some hours before they are packed, as this tends to wilt the stems and keep the berries from falling off in transit. The fruit must be perfectly dry when packed, and should be as cool as possible. It must be firmly packed, as a slack-packed case always carries badly and the fruit opens up in a more or less bruised condition.